The New England JOURNAL of MEDICINE

FORMERLY THE BOSTON MEDICAL AND SURGICAL JOURNAL

Official Organ of The Massachusetts Medical Society
The New Hampshire Medical Society — The Vermont State Medical Society
The New England Surgical Society — The Boston Surgical Society, Inc.
The New England Pediatric Society — The New Hampshire Surgical Club
And The New England Obstetrical and Gynecological Society

Hospital Library

OWNED AND PUBLISHED BY THE MASSACHUSETTS MEDICAL SOCIETY

Volume 204 Number 21 | Domestic $6 per Annum, 25c per Copy Canada $7.04, Foreign $7.56 | MAY 21, 1931 | Published Weekly in Boston at 165 Newbury Street

CONTENTS

Funnel Chest Deformity. *John G. Kuhns* 1077

Congenital Abnormalities of the Lumbo-sacral Region as Causes of Persistent Low Back Pain. *Edwin Pyle* 1083

Hemorrhage in Pulmonary Tuberculosis. *John B. Hawes, 2nd* 1088

Studies in Fat Metabolism, IV. New procedures for quantitating the organic phosphorus in small amounts of bile. *Charles W. McClure, Esther L. Bloomberg,* and *Mildred E. Huntsinger* 1091

Physiology of the Ovarian Hormones. A Review of Some Recent Literature. *Henry S. Finkel* 1094

A Case of Purpura with Unusual Necropsy Findings. *Herbert Pollack* 1098

Ethyl-Iodide in Ear, Nose, and Throat. *Joseph Prenn* 1099

Transplantation of the Gall Bladder. *Wayne J. Stater* 1101

The Spring Meeting of the Harvard Medical Alumni Association 1103

CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

Case 17211—Fever, Emaciation and Secondary Anemia without Known Cause. *Richard C. Cabot, George W. Holmes* and *Tracy B. Mallory.* Case 17212—Paroxysmal Nocturnal Dyspnea, Corrigan Pulse, Nocturia and Irrationality in a Diabetic. *Sven M. Gundersen, Tracy B. Mallory, Chester M. Jones, George W. Holmes* and *Walter Bauer* 1110

EDITORIALS

Thallium, a Dangerous Drug 1117

Happiness—The Panacea of Delinquency 1117

This Week's Issue 1118

(*Contents continued on next page*)

Unqualified endorsement

of J. CHALMERS DaCOSTA'S "PAPERS and SPEECHES"

"They cannot help but be more than spellbinding. As a teacher he is without an equal—the greatest surgical diagnostician that ever stood in any ampitheatre. The medical world is richer today by this publication."—*Dr. J. W. Lane,* Kenosha, Wisconsin.

"Dr. Da Costa's 'Papers and Speeches' are better than you say they are. There is something inspirational in every article."—*Dr. L. A. Hamilton,* Lambertville, N. J.

"If this is Dr. J. Chalmers Da Costa's own book forward at once, and if it *is* his book, be sure that the price is high enough so as properly to evaluate the gems and jewels that must be in it."—*Dr. C. J. Wickert,* Allentown, Pa.

"Of course I've got to have the 'Papers and Speeches' of J. Chalmers Da Costa—what medical man doesn't? I venture to say it will break all sales records for you."—*Dr. Frederick R. Taylor,* High Point, N. C.

"I have read it twice and prize it very much. No physician should miss this rare treat, especially those of us who were his students."—*Dr. Paul R. Walters,* Berkeley, Calif.

Octavo volume of 440 pages, with portraits. By J. CHALMERS DA COSTA, M.D., LL.D., Samuel D. Gross Professor of Surgery at Jefferson Medical College, Philadelphia. Cloth, $6.50 net.

W. B. SAUNDERS COMPANY **Philadelphia and London**

Entered at the Postoffice at Boston as Second Class Matter

CONTENTS

(Continued)

MASSACHUSETTS LEGISLATIVE NOTE 1119

BOOK REVIEWS

A Manual of the Common Contagious Diseases. Philip Moen Stimson 1128

The Pathology of Generalized Vaccinia in Rabbits. Ralph D. Lillie 1128

CORRESPONDENCE

An Appeal to the Family Physician. Solomon H. Rubin 1121

The Committee on the Costs of Medical Care. C.-E. A. Winslow 1121

Problems Incident to Dealing with Venereal Diseases. N. A. Nelson 1121

MISCELLANY

A Broadcasting Message by the State Department of Public Health. Use and Abuse of Cancer Resources. Channing C. Simmons 1119

Mortality Rates 1120

NOTICES 1122

REPORTS AND NOTICES OF MEETINGS 1123

SOCIETY MEETINGS, CONGRESSES AND CONFERENCES 1128

The Massachusetts Medical Society

The next annual meeting of the Massachusetts Medical Society will be held in Boston, Monday, Tuesday and Wednesday, June 8, 9 and 10, 1931.

OFFICERS AND STANDING COMMITTEES ELECTED BY THE COUNCIL, JUNE 17, 1930

PRESIDENT: ROBERT B. GREENOUGH, 8 Marlborough Street, Boston.
VICE-PRESIDENT: THOMAS H. McCARTHY, 142 Main Street, Brockton.
SECRETARY: WALTER L. BURRAGE, 182 Walnut Street, Brookline.
TREASURER: ARTHUR K. STONE, Auburn Street, Framingham Center.

STANDING COMMITTEES FOR 1930-1931

COMMITTEE OF ARRANGEMENTS
H. Q. Gallupe, T. H. Lanman, F. H. Colby, G. P. Reynolds, W. M. Shedden.

COMMITTEE ON PUBLICATIONS
Homer Gage, J. W. Bartol, R. I. Lee, R. B. Osgood, E. W. Taylor.

COMMITTEE ON MEMBERSHIP AND FINANCE
D. N. Blakely, Algernon Coolidge, Gilman Osgood, G. C. Caner, J. E. Fish.

COMMITTEE ON ETHICS AND DISCIPLINE
David Cheever, W. D. Ruston, S. F. McKeen, A. C. Smith, R. L. DeNormandie.

COMMITTEE ON MEDICAL EDUCATION AND MEDICAL DIPLOMAS
P. P. Johnson, H. P. Stevens, C. H. Lawrence, C. A. Sparrow, E. S. Calderwood.

COMMITTEE ON STATE AND NATIONAL LEGISLATION
R. B. Greenough, T. J. O'Brien, F. E. Jones, Shields Warren, A. W. Marsh.

COMMITTEE ON PUBLIC HEALTH
Dwight O'Hara, E. F. Cody, T. F. Kenney, F. G. Curtis, G. N. Hoeffel.

COMMITTEE ON MALPRACTICE DEFENCE
F. G. Balch, E. D. Gardner, F. B. Sweet, R. P. Watkins, A. W. Allen.

OFFICERS OF THE SECTIONS FOR 1931

ELECTED BY THE SECTIONS

SECTION OF MEDICINE
Chairman, Cadis Phipps, Brookline; *Secretary*, F. Dennette Adams, Boston.

SECTION OF SURGERY
Chairman, G. A. Moore, Brockton; *Secretary*, F. C. Newton, Boston.

SECTION OF TUBERCULOSIS
Chairman, S. H. Remick, Reading; *Secretary*, Roy Morgan, Westfield.

SECTION OF PEDIATRICS
Chairman, Fred H. Allen, Holyoke; *Secretary*, Joseph Garland, Boston.

SECTION OF OBSTETRICS AND GYNECOLOGY
Chairman, A. K. Paine, Boston; *Secretary*, F. J. Lynch, Boston.

SECTION OF RADIOLOGY AND PHYSIOTHERAPY
Chairman, A. H. Ring, Arlington Heights; *Secretary*, Ralph D. Leonard, Melrose.

OFFICERS OF THE DISTRICT MEDICAL SOCIETIES

ELECTED BY THE DISTRICT MEDICAL SOCIETIES BETWEEN APRIL 15 AND MAY 15, 1930

(The street addresses of the officers may be obtained from the Annual Directory.)

BARNSTABLE—*President*, H. D. Handy, Harwich; *Vice-President*, C. J. Bell, Wellfleet; *Secretary*, J. I. B. Vail, Hyannis; *Treasurer*, H. B. Hart, Yarmouthport; *Librarian*, E. E. Hawes, Hyannis.

BERKSHIRE—*President*, B. W. Paddock, Pittsfield; *Vice-President*, P. J. Sullivan, Dalton; *Secretary*, H. J. Downey, Pittsfield; *Treasurer*, C. T. Leslie, Pittsfield.

BRISTOL NORTH—*President*, T. J. Robinson, Taunton; *Vice-President*, B. M. Latham, Mansfield; *Secretary*, J. L. Murphy, Taunton; *Treasurer*, J. V. Chatigny, Taunton.

BRISTOL SOUTH—*President*, W. A. Nield, New Bedford; *Vice-President*, G. C. King, Fall River; *Secretary and Treasurer*, Charles Shanks, New Bedford.

ESSEX NORTH—*President*, J. E. Bryant, Haverhill; *Vice-President*, H. H. Nevers, Lawrence; *Secretary and Treasurer*, E. S. Bagnall, Groveland.

ESSEX SOUTH—*President*, N. P. Breed, Lynn; *Vice-President*, H. E. Whitaker, Gloucester; *Secretary*, R. E. Stone, Beverly; *Treasurer*, Andrew Nichols, 3rd, Danvers; *Librarian*, C. M. Cobb, Lynn.

FRANKLIN—*President*, H. M. Kemp, Greenfield; *Vice-President*, A. E. Johnson, Greenfield; *Secretary and Treasurer*, Charles Moline, Sunderland.

HAMPDEN—*President*, M. W. Pearson, Ware; *Vice-President*, G. L. Schadt, Springfield; *Secretary and Treasurer*, H. L. Smith, Springfield.

HAMPSHIRE—*President*, J. G. Hanson, Northampton; *Vice-President*, C. H. Wheeler, Haydenville; *Secretary and Treasurer*, F. E. O'Brien, Haydenville; *Librarian*, Jane B. Armstrong, Northampton.

MIDDLESEX EAST—*President*, James Blenkhorn, Stoneham; *Vice-President*, J. H. Blaisdell, Winchester; *Secretary*, A. R. Cunningham, Winchester; *Treasurer*, Richard Dutton, Wakefield; *Librarian*, J. M. Wilcox, Woburn.

MIDDLESEX NORTH—*President*, J. A. Mehan, Lowell; *Vice-President*, G. F. Martin, Lowell; *Secretary*, T. A. Stamas, Lowell; *Treasurer*, M. D. Bryant, Lowell; *Librarian*, P. J. Meehan, Lowell.

MIDDLESEX SOUTH—*President*, Fresenius Van Nüys, Weston; *Vice-President*, F. W. Gay, Malden; *Secretary*, A. A. Levi, Cambridge; *Treasurer*, Edward Mellus, Newton.

NORFOLK—*President*, W. A. Lane, Milton; *Vice-President*, W. B. Keeler, Roxbury; *Secretary*, F. S. Cruickshank, Milton; *Treasurer*, G. W. Kaan, Reading.

NORFOLK SOUTH—*President*, G. M. Sheahan, Quincy; *Vice-President*, M. T. Sweeney, Quincy; *Secretary, Treasurer and Librarian*, N. R. Pillsbury, South Braintree.

PLYMOUTH—*President*, F. W. Murdock, Brockton; *Vice-President*, J. J. McNamara, Brockton; *Secretary*, G. A. Moore, Brockton; *Treasurer*, A. C. Smith, Brockton; *Librarian*, J. H. Weller, Bridgewater.

SUFFOLK—*President*, G. S. Derby, Boston; *Vice-President*, Reginald Fitz, Boston; *Secretary*, L. S. McKittrick, Boston; *Treasurer*, John Rock, Boston.

WORCESTER—*President*, J. W. O'Connor, Worcester; *Vice-President*, E. L. Hunt, Worcester; *Secretary*, E. C. Miller, Worcester; *Treasurer*, R. J. Ward, Worcester; *Librarian*, A. C. Getchell, Worcester.

WORCESTER NORTH—*President*, R. C. Jones, Fitchburg; *Vice-President*, H. R. Nye, Leominster; *Secretary*, C. H. Jennings, Fitchburg; *Treasurer*, F. H. Thompson, Jr., Fitchburg.

The New England
Journal of Medicine

VOLUME 204 MAY 21, 1931 NUMBER 21

FUNNEL CHEST DEFORMITY*

BY JOHN G. KUHNS, M.D.†

DIFFERENCES in the shape of the thorax are not uncommon. Their frequent occurrence, however, has not led to any careful differentiation of changes in the form of the chest of purely academic interest and changes which become inimical to health. Funnel chest deformity (pectus excavatum), a depression of the lower portion of the sternum carrying with it the costochondral portions of the fourth to the ninth ribs, with a marked decrease in the anteroposterior diameter of the chest at the xyphoid, is one of the less common of these deformities. (Fig. 1.) Lang[1] found funnel chest deformity in three and one-half per cent. of the children in the first year of school, the deformity occurring with about equal frequency in both sexes. While the congenital type occurs, the deformity is much more commonly developmental in character. In its severer forms it becomes a serious menace to health. Consequently it deserves careful study, particularly in the application of measures to prevent its development in children.

FIG. 1. Moderately severe funnel chest deformity in child of five.

Funnel chest deformity is seen chiefly in individuals of slender skeletal build, the hyperontomorph type of Bean[2]; it is almost never found in persons of heavy skeletal build, the meso-ontomorph type of Bean[2]. The differences in the form of the chest incident to the type of body build have been described by Bryant[3] and Goldthwait[4]. Since a knowledge of the chief anatomical differences in these two types helps in appreciating the method of development of funnel chest in the slender type, a brief review of these differences is given.

In the slightly built person the thorax is long and slender; the ratio of the lateral diameter of the chest to its anteroposterior diameter is greater than the general average of two and one-half to one. The subcostal angle is often less than ninety degrees. The angle formed by the manubrium and the body of the sternum (angulus Ludovici) is usually less than one hundred and seventy degrees. The sternum and costal cartilages usually form a flat surface instead of a convex arc. The ribs are relatively long and slender. In the heavy person the chest is relatively short and deep; the ratio of the transverse diameter of the thorax to the anteroposterior diameter is less than the average of two and one-half to one. The subcostal angle is often greater than a right angle. The angulus Ludovici approaches a straight line (one hundred and eighty degrees). The arc formed on the anterior surface of the chest by the sternum and costal cartilages is often moderately convex. The ribs are relatively short and heavy. (Fig. 2.)

In children of slender skeletal build faulty posture is always found where funnel chest deformity is present. The changes in the thoracic configuration in faulty posture suggest that they may be the precursors of this deformity. These postural changes have been described by Brown[5] and Haynes[6]. Briefly, there is a deepening of the supra- and infraclavicular fossae associated with a forward droop of the head and shoulders. The dorsal spine becomes moderately bowed and this is associated with a more dependent position of the ribs. The chest anteriorly becomes flattened, tending, in the more severe faulty posture, to a slight concavity over the lower sternum and costal cartilages. The subcostal angle becomes narrower, and the angulus Ludovici becomes more acute. Roentgenological examination of such thoraces will show a lowered position of the diaphragm, particularly in the standing position, with a lowering of practically all

*From the Posture Clinic of the Children's Hospital

†Kuhns—Assistant in Orthopaedic Surgery, Harvard Medical School. For record and address of author see "This Week's Issue", page 1118.

of the abdominal viscera. In the observation of a large series of children for a period of years, the apparent gradual transition from the flat chest of faulty posture to the funnel chest deformity can be followed readily. (Figs. 3 and 4.)

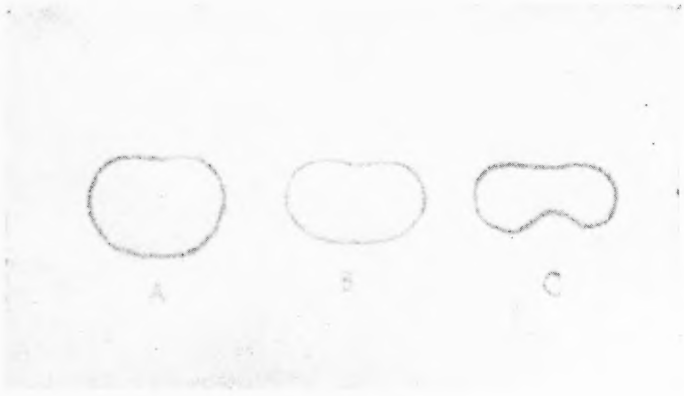


FIG. 2. Chest tracings at xyphoid.
A. 10-year-old child of heavy anatomic type.
B. 10-year-old child of slender anatomic type.
C. 10-year-old child of funnel chest deformity.

Certain deformities of the body change the shape of the chest secondarily but do not produce funnel chest deformity. The commonest

FIG. 3. Mild funnel chest deformity with moderately faulty posture.

of these is scoliosis, which produces a diagonal distortion of the chest[7]. Absence, or paralysis, of muscles attached to the thorax produces only slight changes in the shape of the thorax. Reider[8] observed the occurrence of funnel chest deformity in a patient in whom the pectoral muscles were absent. The author has had under observation two cases in which the pectoralis major and minor muscles were absent, in one case on both sides, in the other case on one side. In neither of these cases was there any asymmetry of the chest nor any apparent retardation in thoracic development. Occasionally one finds, after an attack of poliomyelitis, an isolated paralysis of the trapezii and rhomboids. Here there is a flattening of the chest but no other thoracic change. In unilateral paralysis of the diaphragm and in empyema as well, there is a greater flattening of the affected side of the chest with a drawing in of the lower ribs on the affected side toward the midline[9]. Where the diaphragm is completely paralyzed, the lower portion of the sternum sinks in with each inspiration, probably due to the unopposed pull of the recti muscles. No fixed deformity is produced since the persistence of this condition is incompatible with life.

Varying importance has been assigned to the different factors which may play a part in the evolution of funnel chest deformity. A number of investigators have considered all such deformities to be congenital. Ebstein[10], who gave the first careful description of the deformity, regarded it as an early embryological defect or arrest of the development of the sternum. Intrauterine pressure was first emphasized as a cause by Zuckerhandl[11]. This was later elaborated by Kaumheimer[12], who believed that pressure of the chin or a limb upon the chest in utero was the causative factor. In support of the intrauterine-pressure theory, Raubitschek[13] reported the occurrence of funnel chest deformity in one of newly born twins. In this case the deformity wholly disappeared in two weeks. Bein[14] regarded funnel chest as a persistence of an embryological flattening of the thorax in thirty-seven millimeter embryos. Congenital syphilis and congenital rickets were looked upon as possible causes by Groedel[15] and

Gaucher[16]. Hutchinson[17] saw in both pigeon breast and funnel chest deformity, a reversion to a lower developmental type. From a study of comparative anatomy he divided human thoraces into two types: the bellows and the keel. In the bellows type, found in primates

FIG. 4. Lateral view of child with moderately severe funnel chest deformity showing forward droop of shoulders and prominent abdomen.

and the bat, the transverse diameter of the chest equalled or exceeded the anteroposterior diameter. In the keeled type, found in carnivora and ungulates, the anteroposterior diameter of the chest much exceeded the transverse diameter.

Many of these theories of the cause of funnel chest deformity are no longer tenable in the light of our present medical knowledge. When the deformity is present at birth, it may be due to disturbances in the development of the sternum[18] or, in unusual cases, to intrauterine pressure. However, most of the cases, as a number of investigators observed, first give evidence of the deformity in early childhood. In this developmental type, rickets has usually been considered the chief cause. Eggel[19], in 1870, ascribed it to a nutritional disturbance which made the sternum more flexible so that it became depressed by atmospheric pressure. Hogmann[20] suggested abnormally relaxed chondrosternal articulations as the cause. Flesch[21] considered it due to an abnormal length of the ribs. An inflammation of the mediastinal glands was believed by Jacobi[22] to be the cause in certain cases through the production of adhesions and retraction of the sternum. Landouzy and Dejerine[23] observed it in cases of progressive muscular atrophy. Laennec[24] taught that certain occupations, such as cobbling, might produce it. Here again, much that has been written is of historical interest only, since the conclusions were drawn from an incomplete knowledge of the mechanics of the body and the physiology of respiration. But before offering a mechanical explanation for the development of funnel chest, we should consider the rôle played by rachitic infections.

Funnel chest deformity does not appear in rickets without a disturbance in the breathing mechanics. Foote[25] has given clinical evidence to show that rickets tends to give the infantile type of thorax, one rounded in outline with the anteroposterior and lateral diameters almost equal[26]. With disturbances in breathing, often from bronchial infections so common in rachitic children, Foote noticed a gradual depression of

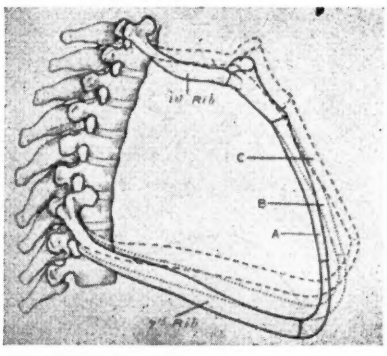


FIG. 5. (From Gray's Anatomy.) Diagram showing the upward and outward motion of the sternum with normal function of the diaphragm.

the lower portion of the sternum. Rickets, with a faulty ossification of bone, does produce a weakness of the sternum and ribs and this weakness is shown chiefly where the greatest muscle pull occurs, at the xyphoid and lower costochondral junctions and ribs. With the diaphragm normally functioning (as will be shown later), the tendency is to make the sternum more prominent, giving in extreme cases a pigeon-breast deformity; with the pull of the diaphragm changed by a lowered position, the lower sternum is pulled inward and here the development of a funnel chest deformity is aided by rachitic infection, though such an infection is not necessary for its development. Harrison[27], one of the earliest writers on thoracic deformities, described the commonest rachitic deformity of the chest, the so-called Harrison's groove, a depression or gentle concavity running transversely across the lower part of the chest at the level of the attachment of the diaphragm anteriorly. This depression disappears in later childhood to a marked degree and is indicated merely by an outward flaring of the lower borders of the ribs.

The chest, for normal development, requires a proper distribution of pressure and muscle

pull within and from the outside. Changes in muscle action or disturbance with the function of the lungs will, in time, produce changes in the chest wall, as observations in scoliosis and tuberculosis have often shown. In normal respiration the chest cavity is enlarged by elevation of the ribs, contraction of the diaphragm, or by a combination of these two. Due to the axis of rotation of the ribs on the transverse processes of the vertebrae, as the ribs are elevated in inspiration, there is an increase in both anteroposterior and lateral diameters of the chest. (Fig. 5.) The rib rolls outward as it moves upward, producing at the same time a torsion of the cartilaginous portion of the rib near the sternum. The sternum is displaced upward and forward by this motion of the ribs. The muscles responsible for this movement are the fibers of the diaphragm, which are attached to the thoracic wall anteriorly, aided by the levatores costarum, the intercostales externi, the scaleni anteriores, and, when the scapulae are fixed, the pectorales, and the sternocleidomastoidei, when the head is held erect. On expiration these muscles relax and the intercostales interni, the triangularis sterni, the iliocostales and the quadrati lumborum pull the ribs and sternum down and back.

In faulty posture respiration is carried on in a mechanically disadvantageous manner. With the slumping and forward position of the shoulders and head, with the more lateral position of the scapulae, the insertion of the pectoralis major muscle is brought farther forward and its action as an elevator of the ribs is lost. Also the serratus anterior, which assists in the elevation of the lateral portions of the fourth to the ninth ribs, loses much of its mechanical efficiency. The usual forward bowing of the dorsal spine aids in producing a more dependent position of the ribs and, secondarily, a flattening of the chest. But the most serious feature in this disturbance in the mechanics of respiration is the lowered position of the diaphragm. (Fig. 6.) The upward and outward pull of the anterior fibers of the diaphragm is lost when the central tendon of the diaphragm is below the seventh rib anteriorly. In short, faulty posture offers all the mechanical conditions necessary for the development of a funnel chest deformity. In the cadaver, where one finds a slight exaggeration of the position of full expiration, a pull on the anterior fibers of the diaphragm toward the central tendon of the diaphragm moves the lower sternum and costal cartilages upward and forward. If the central tendon of the diaphragm is lowered more than one costal interspace, a pull on the anterior fibers of the diaphragm in the direction of the central tendon produces an inward retraction of the lower sternum.

Hoover[28], in animal experiments, has shown that downward displacement of the diaphragm puts the diaphragm at a mechanical advantage in restraining the divergence of the costal borders. He further showed that there occurred a diminution of the inspiratory widening of the subcostal angle, a retraction inward of the

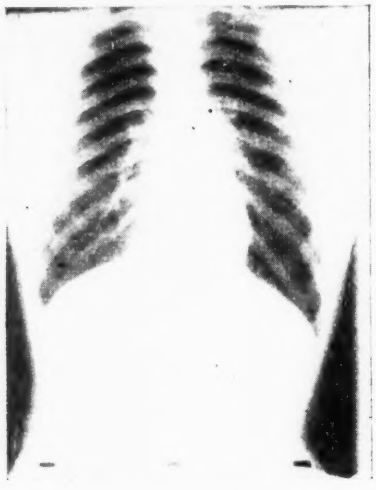


FIG. 6. X-ray of thorax in mild funnel chest deformity. Note the low position of the diaphragm.

lower end of the sternum and an approximation of the hypochondriac regions towards the median line. When the central tendon of the diaphragm is lowered, the action of the intercostales externi, in raising the ribs and expanding the horizontal diameters of the chest, is lost, according to Muller[9], while the inward pull of the diaphragm is mechanically increased. In attacks of bronchial asthma and in other diseases where there is interference with normal expiration, the diaphragm, as shown by the fluoroscope, assumes a lower position below the partially expanded lungs. In such conditions further attempts at inspiration produce a retraction inward of the lower portion of the sternum with each inspiration. Van den Bergh[29] has observed the development of a sternal deformity in a case of asthma. Hofbauer[30] found a sinking in of the lower portion of the sternum and the adjacent costal cartilages, a typical condition in children with air hunger. He believed that prolonged disturbance in respiration tended to make this a fixed change in the thorax. During the past two years the author has observed twenty cases of funnel chest deformity, in various degrees of severity, associated, in each instance, with marked faulty posture. The history and appearance of the children, except in those cases where the deformity was a congenital one, suggested a causal relationship between the posture and the thoracic deformity[1, 31].

Among the earlier writers on funnel chest deformity there was no unanimity of opinion as to its importance; by many it was considered merely a cosmetic defect. With careful pathological studies, however, and with a fuller understand-

ing of the physiological disturbances which such displacement of thoracic and abdominal viscera produces, has come an appreciation of the rôle of this condition in inducing fatigue, subnormal health and disease. The pathological investigations of Bein[14] and Frühwald[32] showed the marked displacement of the mediastinal contents, the faulty development of the lungs and the cardiac hypertrophy which may occur.

In cross section at postmortem, Henschen and Nägeli[33] found definite pressure by the depression in the chest wall on the right ventricle with pericardial inflammation and hypertrophy of the left ventricle. Finlay[34] reported four cases in which thoracic deformity had resulted in gradual hypertrophy and dilatation of the heart. He stated that the lung capacity was diminished twenty to sixty per cent. of the normal amount in these cases. Shively[35] found ten cases of tuberculosis in seventeen individuals with funnel chest deformity. He concluded that such chest deformities acted as predisposing causes of tuberculosis. In a study of thoracic development and deformities, Sato[36] showed a definite relationship between the shape and movement of the thorax and pulmonary tuberculosis. Dyspnoea, palpitation and bronchitis were frequently found by Hoffmeister[37] in patients with funnel chest deformity. He states that tuberculosis was almost always present in men who had such a deformity. The hypoventilation of the lungs which the thoracic deformity causes was believed by Epstein[38] to be a predisposing cause to respiratory infections in children.

In the milder types actual disease of the thoracic viscera is not usually found, but in every case there is evidence of decreased physical efficiency. While there is no quantitative measurement of health, easy fatigability and a lack of gain in weight and height have been constant findings in the less severe cases of funnel chest deformity studied. In an attempt to estimate the physical fitness of youths in the public schools of Manchester, England, Mumford[39] found that the best criterion of innate bodily vigor was the measurement of movement in the submammary regions of the thorax and in the posterolateral regions of the tenth to the twelfth ribs. Persistence and continuance of effort were found very rarely in youths when active motion and free expansion in these regions of the thorax were lacking. In funnel chest deformity lateral expansion and movement of the chest in the submammary region is markedly restricted. One finds an average chest expansion at the xyphoid of three-quarters of an inch, where the normal chest expansion should average about two and one-half inches, and the vital capacity is often half that found in normal children of comparable age and body-build. In funnel chest deformity compression by the deformity and decreased motion of the diaphragm may produce serious fatigue. Lemon[40], in a series of ingenious experiments on diaphragmatic function, came to the conclusion that chest pressure on the lower thorax, and not a decrease in the movement of the diaphragm, was the most important cause of respiratory incompetence following abdominal operations.

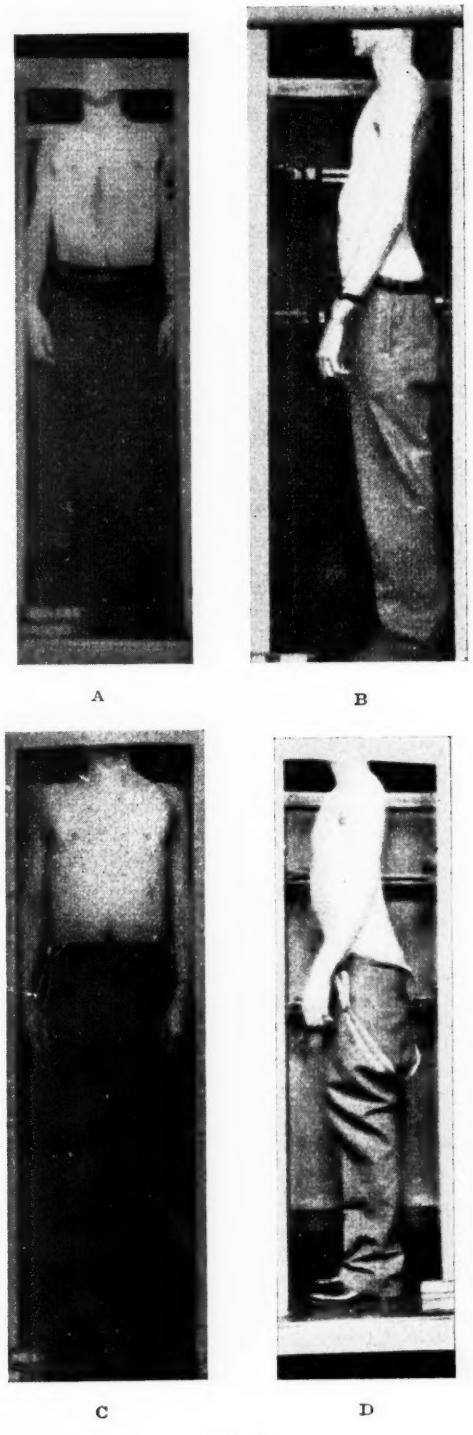


FIG. 7.

A and B. Moderately severe funnel chest deformity.
C and D. The same patient after three years of postural exercises.

He found that the efforts of the patient to secure adequate amounts of air produced a gradual but serious fatigue.

Because of disability observed in the severe grades of funnel chest deformity many methods have been devised for its correction. Hoffa[41] advised the use of adhesive traction on the lower sternum. John Ball Brown[42] used braces and exercises. Operative attempts to correct the deformity have been made by Zuckerhandl[11], Meyer[43], Sauerbruck[44] and Zahradnicek[45]. But most writers agree with Steindler[31] that operations are not successful and are not indicated. Lang[1], Möhring[46] and Steindler[31] are of the opinion that the greatest correction can be obtained with thoracic exercises. In the author's cases marked improvement in the chest deformity, with improvement in chest expansion and general health, have followed where a simple régime of rest and postural and thoracic exercises was followed. So far as could be determined, the congenital and acquired types were equally amenable to correction. In one case with moderate funnel chest deformity there was complete disappearance of the deformity after three years of persistent treatment with rest and postural exercises. (Fig. 7.)

Treatment should be directed, first, to the avoidance of excessive fatigue. Since these children tire more readily than normal children, little can be expected in the way of correction unless adequate rest is given. Rest periods of one-half to one hour at noon and after school with at least twelve hours in bed at night have been the minimal requirement. Secondly, the poise of the body has been corrected since this, associated with a disturbance in the mechanics of respiration, has been the chief factor in the developmental type of funnel chest deformity observed in children. The forward droop of the head and shoulders, the rounded dorsal spine and the prominent abdomen have been replaced by habitual good carriage of the body. Thirdly, special exercises have been given to increase the lateral rib expansion and widen the costal angle. Breathing exercises, with the sides of the chest held firmly so that pressure is brought to bear within the chest against the sternum, have been found helpful. In a few cases a sandbag or pillow under the mid-dorsal spine has been used for half-hour periods several times a day to hasten correction. But lasting correction of funnel chest deformity has been obtained only where fatigue has been eliminated and where habitual good posture has been obtained.

SUMMARY

Funnel chest deformity is found chiefly as a developmental deformity in the slender type of child with faulty posture. The chief factor in its development is a disturbance in the mechanics of respiration, associated with a low position of the diaphragm. Various investigators have shown its frequent association with serious physical disabilities. The treatment that has been found most efficacious in preventing, as well as in correcting, the deformity has been the avoidance of fatigue, the remedying of faulty use of the body, and the maintenance of good carriage.

REFERENCES

1 Lang, K.: Klin. Wchnschr. 7:1283, 1928.
2 Bean, R. R.: Johns Hopkins Hosp. Bull. 23:363, 1912.
3 Bryant, J.: Boston M. & S. J. 170:795, 1914.
4 Goldthwait, J. E.: Boston M. & S. J. 172:881, 1915.
5 Brown, L. T.: Am. J. Orthop. Surg. 15:774, 1917.
6 Haynes, R. S.: Am. J. Dis. Child. 36:1093, 1928.
7 Hedblom, C. A.: J. A. M. A. 94:162, 1930.
8 Reider: Quoted by Shively, loc. cit.
9 Muller, G. P.: Minnesota Med. 12:742, 1929.
10 Ebstein, W.: Deutsches Arch. f. klin. Med. 30:411, 1882.
11 Zuckerhandl, E.: Quoted by Ribbert. Deutsche Med. Wchnschr. 1884, 533: Deutsche Archiv. 30:411.
12 Kaumheimer, L.: Ztschr. f. orthop. Chir. 39:68, 1919.
13 Raubitschek, F.: Arch. f. Orthop. u. Mechanotherapie 4:87, 1906.
14 Bein, G.: Ziegler's Beitr. z. path. Anat. 52:567, 1912.
15 Groedel, F. M.: Münch. med. Wchnschr. 58:684, 1911.
16 Gaucher: Semaine méd. 21:359, 1901.
17 Hutchinson, W.: J. A. M. A. 29:512, 1897.
18 Walther: Virchows Arch. f. path. Anat. 212:68, 1913.
19 Eggel: Virchows Arch. f. path. Anat. 49:230, 1870.
20 Hogmann, N.: Jahrb. f. Kinderh. 25:514, 1880 .
21 Flesch, M.: Virchows Arch. f. path. Anat. 57:289, 1873.
22 Jacobi: Quoted by Shively, loc. cit.
23 Landouzy, L. and Dejerine, J.: De la Myopathie Atrophique Progressive. F. Alcan, Paris, 1885.
24 Laennec, R.: De l'Auscultation Médiate. J. A. Brosson & J.-S. Chaudé. Paris, 1819.
25 Foote, J.: Internat. Clin. 2:239, 1922.
26 Scammon, R. E. and Rucker, W. H.: Am. J. Dis. Child. 21:552, 1921.
27 Harrison, C. H. R.: Deformities of the Spine and Chest. J. Churchill, London, 1842.
28 Hoover, C. F.: Arch. Int. Med. 12:214, 1913.
29 Van den Bergh, A. A. H.: Nederl. tijdschr. v. geneesk. 2:1245, 1919.
30 Hofbauer: Quoted by Hoffmeister, loc. cit.
31 Steindler, A.: Diseases and Deformities of the Spine and Thorax. C. V. Mosby Co., St. Louis, 1928.
32 Frühwald, H. C.: Beitr. z. path. Anat. u. z. allg. Path. 56:13, 1913.
33 Henschen, C. and Nägeli, T. R.: Handb. d. prakt. Chir., 5th ed., Stut. 1924, vol. 6, p. 563.
34 Finlay, F. G.: Connecticut M. A. J. 11:10, 1921.
35 Shively, H. L.: Am. Med. 7:26, 1912.
36 Sato, S.: Deutsche Ztschr. f. Chir. 126:1, 1913.
37 Hoffmeister, W.: Beitr. z. klin. Chir. 141:215, 1927.
38 Epstein: Am. J. Dis. Child. 34:634, 1922.
39 Mamford, A. A.: Lancet 1:478, 1922.
40 Lemon, W. S.: Minnesota Med. 11:675, Oct. 1928; ibid. 11: 725, Nov. 1928.
41 Hoffa, A.: Lehrbuch der orthopädischen Chirurgie. F. Enke, Stuttgart, 5th ed., 1905.
42 Brown, J. B.: Case Reports in Orthopaedic Surgery. Boston, 1838.
43 Meyer, L.: Berl. klin. Wchnschr. 48:1563, 1911.
44 Sauerbruck, F.: Chirurgie der Brustorgane. Berlin, 1920. 2nd ed., vol. 1, p. 437.
45 Zahradnicek, J.: Cas. lék. cesk. 64:1814, 1925.
46 Möhring, P.: Ztschr. f. orthop. Chir. 48:455, 1927.

CONGENITAL ABNORMALTIES OF THE LUMBO-SACRAL REGION AS CAUSES OF PERSISTENT LOW BACK PAIN

BY EDWIN PYLE, M.D.*

ALL physicians doing compensation work are familiar with the young to middle-aged individual who has suddenly experienced a disabling pain in his lower back while performing a task which he has accomplished many times without any suggestion of pain. It is sharp and piercing in character, and is generalized over the entire lower back. The patient is generally forced to stop work and is assisted home by friends, where he remains confined to bed for weeks.

His back is strapped, heated, and massaged. The pain settles down to a dull persistent ache which may, or may not, radiate down the legs along the course of the sciatic nerve. It is exaggerated by movements of the back and attempts to stand erect, and is sharp and stabbing on coughing or sneezing. The patient sleeps on his side with his legs drawn up.

After several weeks or months, he finally gets about, and an x-ray picture is taken and reported as showing no fracture, disease or dislocation. A brace is prescribed, and baking and massage instituted. After six months to a year of this sort of treatment, without relief, the patient becomes discouraged, the insurance company skeptical, and the doctor disgusted with the case. All wish it settled and closed, but this is not possible so long as the individual claims disability. A lawyer is generally brought in at this stage of the proceedings, and complicating testimony of several doctors adds to the confusion.

The insurance company has already carried the man along and paid his doctors' bills for a year, while the man's dependents have subsisted on this half-pay for the same length of time. The Compensation Commissioner is puzzled and decides that, in fairness to all parties, he will wait and see what happens. The man has an earning capacity as a watchman or timekeeper, but fears to return to work lest he establish this definite earning capacity and the burden of relief from his back pain be shifted from the insurance company to himself. He is becoming habituated to the brace and weaned from the desire to work. He doubts if his back will ever be well, and has visions of a large monetary reward for his sufferings. His mental attitude makes him a very poor subject to treat, and his antagonism toward doctors is on the increase.

More x-rays are taken, and the report comes again that no fracture, disease or dislocation is seen. Here lies the crux of the whole situation. The faulty interpretation of the x-rays and the reliance on the negative finding of no fracture, disease or dislocation, have misled all concerned. The patient knows he has pain in his lower back, despite the x-ray report; the insurance company begins to doubt the patient because of the x-ray report; and the doctor finds himself the buffer between the two.

The proper evaluation, in the beginning, would have given a fair idea of what to expect. The realization of the numerous congenital weaknesses which may occur in the lower back, and an appreciation of the fact that their presence, in any given case of backache, makes recovery a slow process, would remove a good deal of the doubt in the minds of interested parties.

To appreciate the variations from the normal it is first necessary to know what normal is, and have an understanding of the mechanics involved.

The lower back is the hinge which joins the trunk to the legs, and therefore is subjected, because of the leverage and strength of the trunk and legs, to severe violence. We should remember that this part of the spine underwent most changes in shape when we arose from all fours to walk on our hind legs, and that of any other part of the skeleton it shows the greatest variations from what is considered normal. Strangely enough, as a means of identification in the mature adult, it is as distinctive as one's features, because of the variations in sizes and shapes of its component parts. Its principal characteristic should be strength. Mobility, unlike the dorsal and cervical region, is of secondary importance. The vertebrae are large and heavy, the intervertebral discs thick, and the muscles numerous.

Normally, there are five lumbar vertebrae, but the presence of four or six is not uncommon, and, so far as numbers go, is of no special importance. The articulations of the fifth lumbar vertebra with the sacrum face laterally, as they do in the other lumbar vertebrae. This gives strength, in contradistinction to the anteroposterior shingle-like arrangement of the dorsal vertebrae, which allows mobility. The lateral processes, to which the muscles are attached, are short and thick; the spinous processes are wide and short, and separated from each other by the interspinous ligaments. The fifth lumbar vertebra rests upon the superior surface of the sacrum. This surface is tilted forward to form an angle, with a horizontal plane, not to exceed 45 degrees. The pedicles firmly unite the posterior part of the vertebra (laminae spinous processes and transverse processes) to the anterior part (body) by the natural fusion which takes place in infancy.

*Pyle—Attending Orthopedic Surgeon, Waterbury Hospital. For record and address of author see "This Week's Issue", page 1118.

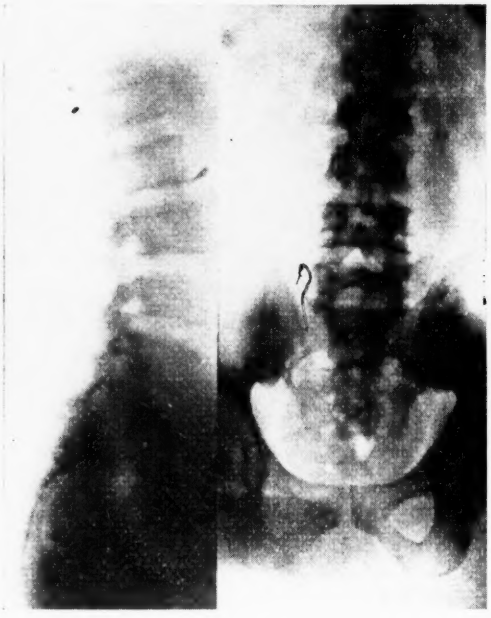
It is in the variations of these component parts of the fifth lumbar vertebra and the sacrum, and their relationship to each other, that the causes of persistent low back pain are found. Every part that goes to make up the vertebra may depart from the normal in such a way as to be the

A case of asymmetrical articulations. The joint on the right side faces laterally while the one on the left side faces anteroposteriorly.

cause of pain; the articulations, the spinous processes, the transverse processes, the pedicles, and the body, are all of them important, individually, in their structure, and collectively, in their relationship to each other.

I.—A variation in the direction in which the articulations between the fifth lumbar vertebra and the sacrum face is a common abnormality. If one joint faces anteroposteriorly, and the other laterally, it is evident that the one or the other (never both together) will be subjected to double strain in certain movements because of this asymmetry. If both face anteroposteriorly they give an increase in mobility of the lower back, which naturally detracts from its strength (the shoulder joint and the hip joint being analogous points elsewhere in the body where mobility replaces strength). In forward bending, for instance, the anteroposterior type of articulations in the fifth lumbar vertebra is subjected to severe strain, since there is only one intervertebral disc between the fifth lumbar vertebra and the sacrum, to take up the change in shape of the spinal column. Therefore, as flexion is increased, more strain is thrown on this joint—the joint above being of the normal lateral type. In backward bending, in this type of joint, the fifth lumbar part (the superoposterior half) slides back and impinges on the base of the sacral part of the joint. With increase in mobility, which develops in these joints, there must develop a redundancy of the capsule. At times this may become pinched in the joint, causing the sudden sharp pains which are revealed by manipulating the leg or trunk, and often erroneously classified as due to a slipping sacro-iliac joint. In twisting movements the abnormally directed joints between the fifth lumbar and the sacrum are subjected to unequal strains—the one on the right to more strain as one twists to the left, and vice versa. The joints, therefore, between the fifth lumbar vertebra and the sacrum, which do not work in unison, either because they face in different directions, or are not directed laterally to give strength, can be the cause of persistent low back pain.

II.—Enlarged and elongated spinous processes, which come into contact with each other when



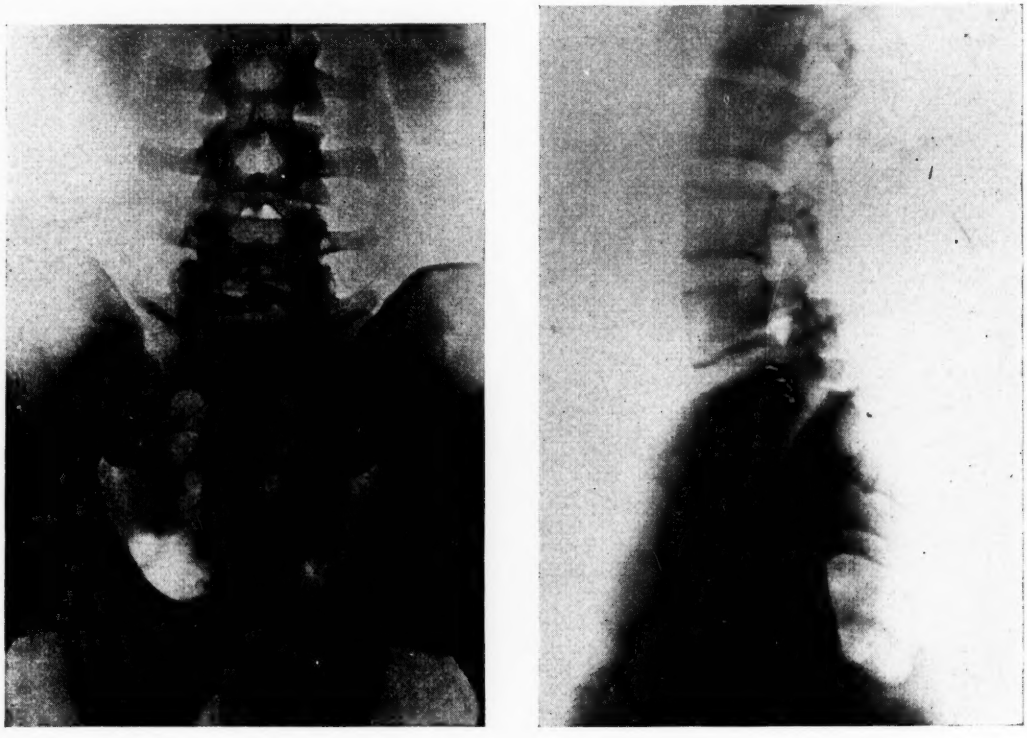
Case of sacralization on one side as seen in the anteroposterior view. The lateral view shows a normal relationship between the sacrum and fifth lumbar vertebra—the former offering a substantial supporting shelf upon which rests the spinal column above.

the trunk is hyper-extended, cause pain and tenderness at the site of contact. This condition is recognizable in lateral x-ray plates, which show the outline of these processes in close proximity, and in the anteroposterior plates by a flattening of the bulbous lower end, suggesting repeated contacts during the period of bone growth. Pain from this type of abnormality is noted generally on hyperextension, and is often troublesome and persistent.

III.—The transverse processes of the sacrum normally fuse together, as did the bodies of the sacrum, to form the complete sacral bone. In

lumbar vertebrae the transverse processes retain their individuality, in normal cases. It is not uncommon, however, to see a fifth lumbar vertebra that, on one side or both, has become completely or incompletely fused through its transverse process with the sacrum. This condition is known as sacralization. The enlarged, overgrown transverse processes, when incompletely fused with the sacrum, cause contact between bones where there is no fibro-cartilage to separate them, and where no joint cartilage exists. This is a source of pain when the bones have been forcibly jammed together by an injury. Complete sacralization means that the fifth lumbar vertebra has lost its membership in the lumbar group and become a part of the sacrum by a process of fusion with it. As there is no abnormal mobility, there is no pain. Great variations in size and shape of the fifth lumbar transverse processes exist; they may be bulbous or triangular in shape, and so enlarged that they strike against the sacrum, or the soft tissues over it, in certain positions of bending.

Of course, all degrees of sacralization exist, from the slightly enlarged transverse process to the complete fusion of it with the sacrum. To determine if abnormal contact is caused between the sacrum and the transverse process of the last lumbar vertebra, it is necessary to take an x-ray view in such a way that the rays pass in a perpendicular fashion between the bones, the tube being directly over the anterior surface of the sacrum. The picture of the bones is somewhat distorted, but the degree of separation of the transverse process and the sacrum, in question, is settled. Such an x-ray view is essential in the complete examination of a low back injury. It also shows whether the sacral segments are fused.



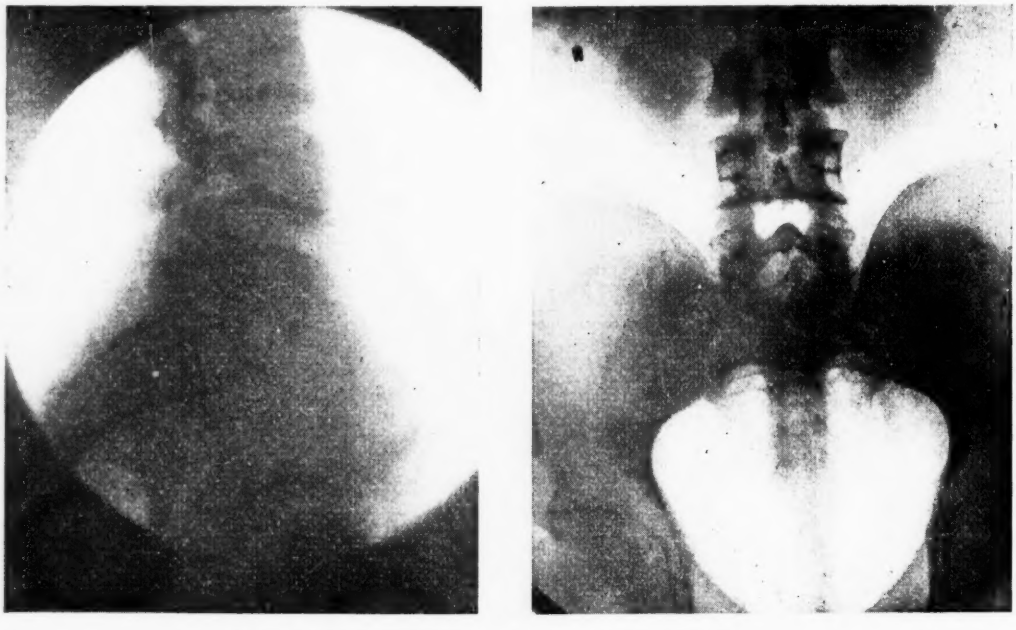
A case of spondylolisthesis showing in the anteroposterior plate the failure of fusion of the laminae of the last lumbar vertebra and the transverse processes lying in front of the upper portion of the sacrum. The lateral plate shows the fifth lumbar body to be forward on the sacrum. This is especially well seen at the posterior border of the fifth lumbar vertebra and sacrum. The failure of fusion of the pedicles to the body of the vertebra which is always present in this condition does not show in the x-rays.

IV.—Failure of fusion of the pedicles, where the posterior elements (the laminae, spinous and transverse processes) do not join with the anterior element (the body), permits of a condition known as spondylolisthesis, where the fifth lumbar vertebral body slips forward into the pelvis, to varying degrees. Such a congenital failure of fusion is always present in this condition. Occasionally it is not demonstrable in the x-rays, but it is always noted at operation, the laminae and spinous process being freely movable. These severe displacements are so striking that they rarely are overlooked, provided the lateral x-ray view is a good one.

V.—A rarer condition, and one about which little has been written, is the backward displacement of the fifth lumbar vertebra. This is only possible when the articulations are of the antero-

posterior type, so that they act as skids to slip the vertebra backwards when undue force is applied from above or below. The pain is due to the disturbed relationship of the joints between the fifth lumbar vertebra and sacrum.

VI.—Abnormalities of the body of the vertebra are less common, the chief consideration of the body being in its relationship to the sacrum, since through it the weight of the trunk is transmitted to the sacrum. Abnormalities of its position are common, as has been mentioned, in the condition known as spondylolisthesis. Suffice it to say that the hemivertebra does occur, with resultant instability and weakness, which is apparent to the most casual observer. This condition is so evident that, like spondylolisthesis, when present, it is readily accepted as a congenital abnormality and a cause of persistent low back pain.



Case of large transverse processes of the last lumbar vertebra which impinge on the sacrum and ilium. The articulations between the last lumbar vertebra and the sacrum are of the anteroposterior type. The lateral view shows a moderately bad forward tilting of the sacrum, the superior surface of which tends to slide the superimposed spinal column forward. In this case, however, the anteroposterior type of articulations have caused the fifth lumbar vertebra under pressure from above or below to be displaced backward.

Up to this point we have dealt only with changes of the fifth lumbar vertebra, and have supposed that the sacrum is normal. There are three common variations in the shape and position of that bone in its relationship to the back that are of great importance; namely, an excessive forward tilting, an exaggerated curve of the bone, and a failure of a fusion of one or more sacral segments.

The superior surface of the sacrum, on which rests the fibro-cartilage, separating it from the fifth lumbar vertebral body, should form an angle of about 45 degrees, with a horizontal plane. Thus it supplies a supporting shelf upon which rests the entire trunk. If the sacrum is inclined forward, or excessively curved forward, this inclined plane begins to approach the perpendicular, and the shelf no longer supports, but tends to slide the superimposed spinal column into the pelvis. A tilt until the superior surface of the sacrum reaches 90 degrees is not uncommon. It is evident, therefore, that undue strain is placed on the joints, ligaments, and muscles of the back as the only means of preventing the trunk from slipping into the pelvis. The pain so caused is described as bearing down and dragging pain. It is relieved by lying down with the knees drawn up, or by bending forward, thereby improving the relationship of the spinal column to the sacrum. It cannot be diagnosed without true lateral x-ray plates. An increase in the lumbar lordosis is only occasionally present at physical examination. It is a deformity of the sacrum as well as a disturbance of its relationship to the fifth lumbar body. Rarely this condition of affairs will involve the fifth lumbar vertebra so that a good supporting shelf for the spinal column is not formed until we reach the superior surface of the fourth lumbar body.

Failure of fusion of the sacral bodies causes an analogous condition. Its presence can only be definitely established by an x-ray plate of the sacrum taken as previously mentioned. These x-ray views are generally termed 45 degree angle plates, the tube being placed so that the rays strike the lumbo-sacral region at a 45 degree

angle, and the sacrum at 90 degrees. Since it is a flat plate of a curved bone, there will be distortions, but the presence or absence of fusion of the sacral segments is easily determined.

Some of these abnormalities exist in varying degrees, and in various combinations in almost every case of low back pain of long standing. The muscle fatigue and weakness which result from involuntary muscle spasm or the too long continued use of a steel brace are added factors as causes of pain.

The question is often asked, why, if these congenital weaknesses have been present since birth, do they not manifest themselves until early middle life? Occasionally they have done so. A careful history will often show that the patient has had backache from time to time of an in-

A case of six lumbar vertebrae with a hemivertebra of the first sacral segment. Easily recognized and accepted as a cause of persistent low back pain but often not so disabling a condition as the less striking abnormality of asymmetrical articulations.

definite but never serious nature, that the back has always been a weak spot, or that special care was necessary to prevent pain in lifting movements.

This is not always the case, however. It can be, and generally is, of sudden and swift severe onset. The strong muscular male who is suddenly incapacitated by low back pain is probably too muscular and too strong for the bony structures of the back to stand the strain. He has been able, up to this time, to compensate for his bony weakness by his muscle strength. Suddenly the muscle strength is exerted against a weak bony structure and a joint is injured, two bones are forced together, some muscle attachments torn loose, or ligaments strained. With his forced inactivity and the use of immobilizing braces, his back weakness increases, and one of the compensating factors gradually diminishes. Other individuals allow their muscles to atrophy from lack of exercise, and take on weight. Thus more work is expected of the weak back, with less muscle strength with which to do it. When the injury is once well established, a vicious circle of lack of exercise, increase in weight, and loss of muscle strength, keeps it up.

The treatment of every case is different. Unfortunately the orthopedist sees most of his cases when they are six months to a year old, after they have been through a routine of braces, massage, and baking, and perhaps vaccine injections for arthritis. Their musculature has often been weakened by the too long use of braces.

The patient's physique, intelligence, and coöperation, and the presence or absence of arthritis, are factors to be considered in a choice of treatment. Every patient should have a careful examination for foci of infection, which are liable to shower intermittently the blood stream with either attenuated bacteria or protein toxins which keep up the activity in the injured region. A careful dietary routine from the start will aid intestinal elimination and combat a tendency to take on weight. The patient needs a good night's rest; otherwise his back muscles are kept in a constant state of contracture so that myositis becomes a complication. He should sleep on a fracture bed. This is more important than the use of any brace or belt at night. A steel brace should be given only in selected cases, especially when the patient is a fit subject for surgery; otherwise a canvas belt is preferable since it does not immobilize so completely. A steel brace cannot be fitted or adjusted to a back that is distorted by protective muscle spasm; it is necessary to wait and fit it after the patient has been relaxed by prolonged rest in bed. Steel braces after operation should be removed within three months; this gives sufficient time for operative fusion to have been completed. Heat and massage give temporary relief; they are necessary for the improvement of circulation, and to restore mobility after operation. Too much importance, however, is not to be placed upon this form of treatment.

For all these abnormalities the operation of choice is a spine fusion, whereby the fifth lumbar vertebra and the sacrum are joined to one another by bone formation, through their articulations, through their laminae, and through their spinous processes. It is wise to make the area of fusion as short as possible, removing, however, any lumbar spinous processes that are in contact. Other lumbar vertebrae are not included in the fusion area if there is no special indication to do so. Relief from pain after operation is not immediate; it will generally disappear during the third or fourth week in bed, but will often recur when the patient becomes ambulatory in the eighth week. It is important here that baking and massage be given, and that the

brace be discarded twelve weeks following operation. The loss of motion caused by the fusion between the fifth lumbar vertebra and the sacrum is so slight that it is imperceptible after the back becomes thoroughly relaxed following its long period of immobilization.

Lumbo-sacral disturbances are far more common than was supposed a few years ago. Not only is it essential to determine the type of congenital abnormality present in this region, but it is also necessary to differentiate between myositis, arthritis, and sacro-iliac disturbances. This latter question is not considered within the scope of this paper.

HEMORRHAGE IN PULMONARY TUBERCULOSIS

BY JOHN B. HAWES, 2ND, M.D.*

THE subject of hemorrhage in pulmonary tuberculosis is an important one and yet one to which, in my experience at least, too little attention has been paid. The result is that its significance as a diagnostic sign of what is often early and favorable tuberculosis is far too frequently overlooked and its treatment is apt to be stereotyped and unintelligent. There are still many physicians who, either through ignorance or because it is the easier way, tell the patient that the blood comes from the nose or a lingual tonsil and, unfortunately, there are many nose and throat specialists who will confirm this opinion. In the meantime the patient, lulled into security, goes his way rejoicing and in consequence either dies or spends months or years as an invalid. When it comes to treatment, the mere fact that the patient has raised some blood in great or small amounts invariably seems to suggest morphia to the doctor's mind. Perhaps in rare instances this may do good, but more often it does harm. In many cases, I would much prefer to give ¼ gr. of morphia to every member of the family rather than to the patient. Be that as it may, I feel that this whole question of hemorrhage in pulmonary tuberculosis needs open and frank discussion.

The best way to obtain reliable and up-to-date ideas on such a subject is not from textbooks or medical journals but from men specializing in tuberculosis and who are in a position to speak with authority. Accordingly, I wrote a personal letter to some of my friends, each one a well-known figure in the field of tuberculosis, asking a series of questions concerning the diagnosis and treatment of pulmonary hemorrhage. Doubtless, they were exceedingly bored, but their replies have far exceeded my expectations in the interest shown and in the fullness of their answers.

For some years I have been accustomed to divide hemorrhages in tuberculosis into two groups, which, for want of better names, I have called "mechanical" and "toxic," respectively. My idea of a "mechanical" hemorrhage is one occurring in the course of a tuberculosis which is either well arrested, inactive, or often one of which the patient is entirely unaware. Chronic fibroid phthisis, for instance, if not too extensive may be, and often is, compatible with a very normal and fairly active existence. A hemorrhage taking place under such conditions means to me that a scar has given way or an adhesion has torn off with the resulting bleeding. It does *not* necessarily mean that the disease is, or has become, active. I admit that many will differ from me in this opinion. The term, "toxic" hemorrhage, on the other hand, to me means bleeding in the course of active, progressive disease. It is comparable to a hemorrhage occurring in typhoid fever. From a strictly scientific or pathological viewpoint there may be little basis for these two groups. As a means of clinical distinction, however, and of making the situation clear to the patient, I find them extremely useful. The treatment of a slight bleeding in a man or woman who is otherwise perfectly well with few or no symptoms is, or rather, should be an entirely different thing from that of a hemorrhage in a patient who is manifestly sick. One requires only a few days or, at most, a few weeks' rest, while the other must be looked upon as a serious affair and treated accordingly. Here again there are many eminent authorities who will differ with me. But there are thousands of general practitioners of the very best type to whom a hemorrhage is simply a hemorrhage, requiring morphia and an icebag, but very little else. The following are the questions asked and a summary of the replies:

I. If a patient has a hemorrhage which you believe to be due to tuberculosis:

A. Does it indicate to you *active* disease?

Out of 26 replies, 19 said "yes" without qualifying remarks; 3 said "no"; the remaining 3, although cautious in their replies, evidently leaned toward activity. Dr. H. A. Bray of Ray Brook, New York, made what I might call a "eagey" answer to the effect that "time alone will answer this question". It is evident the vast majority believes that a hemorrhage means activity. On the whole, I would place myself among the minority.

B. Do you tell the patient and his family that such a hemorrhage means tuberculosis?

*Hawes—President, Boston Tuberculosis Association. For record and address of author see "This Week's Issue", page 1118.

To this question 20 out of 22 answers were most emphatically in the affirmative. Both Dr. Holden of Denver and Dr. Metzger of Arizona said that they always explained the situation to the family and *sometimes* to the patient.

C. In the absence of a positive sputum do you report such cases?

To this 11 answered "yes"; 3 said they did not report such cases because in their state tuberculosis was not a reportable disease. One, Dr. John Lloyd of Rochester, New York, answered, "usually, no". The others said that they reported these cases only after observation and then only if physical signs and x-ray made them feel sure that it was due to tuberculosis. This is, of course, a perfectly proper attitude to take.

D. If a patient has a hemorrhage, even if the temperature and pulse are normal, do you put him at strict rest in bed?

Out of 26 replies, 23 were in the affirmative. Dr. Harry Bray of Ray Brook, New York, feels that, although these patients do not require strict bed rest, their activities should be curtailed. Dr. F. M. Pottenger is apparently of the same opinion. My own views are that in many of these cases strict bed rest is quite unnecessary.

E. How long do you keep them in bed?

Answers to this varied greatly. Dr. O. S. Pettingill of the Essex County Sanatorium in Massachusetts stated "three days plus", while Dr. Jamie Dickie of Southern Pines, North Carolina, and Dr. Hugh Kinghorn of Saranac Lake said "three to six months"! The majority of opinions were to the effect that a patient should rest 3-4 weeks in bed after such a hemorrhage.

The next main question which I asked was:

II. When a patient with quiescent or apparently arrested fibroid phthisis has a hemorrhage:

A. What drugs do you use, if any?

Dr. Harry Bray of Ray Brook, Dr. Jamie Dickie of Southern Pines and Dr. James A. Miller of New York City succinctly answered "none" to this question. Codein was by all means the favorite drug with small doses of morphia a close second. Calcium lactate or some hemostatic serum was the favorite of a few, while one or two used nitroglycerine or sodium nitrite. It was quite evident that there was no accepted routine treatment. As I said earlier in this article, I have generally found that it is the members of the family who need the sedative, rather than the patient.

B. Do you believe in ice bags?

Ten out of 26 replies were strongly in the negative; 7 felt that an ice bag quieted the patient and his heart and therefore did good. Dr. John Lloyd replied, "Good Christian Science." My own feeling about an ice bag is that it is elusive and slippery so that the patient has to keep fairly quiet to have it remain in place. This is the only way that I can see how an ice bag can do good.

C. Do you limit his diet?

Dr. Willard Soper of New Haven, Connecticut, was the only one who came out with a flat-footed "no". I am heartily in accord with his opinion. Dr. Browning of Los Angeles said he might reduce tea and coffee but not otherwise. Others advised liquids or soft solids or reduced the total amount of food, while a few apparently felt that hot drinks were dangerous. My own patients are allowed to eat what appeals to them, providing it is sufficiently nourishing. I do not believe that it makes the slightest difference whether the food or drink is hot or cold.

D. Under what conditions do you advise pneumothorax or other operative procedures?

The answers to this question were practically unanimous that pneumothorax was indicated in all cases of severe and continued bleeding, providing, of course, the case was otherwise suitable for this procedure. Dr. Heise of Saranac Lake was the only one who on the whole "preferred to wait" before instituting pneumothorax.

The previous questions have all referred to hemorrhage and its treatment in the course of *inactive tuberculosis* as in a chronic, fibroid phthisis, for instance, when temperature and pulse are normal and cough and raising often very slight. Many patients of this type are working regularly. The hemorrhages under such conditions I have called "mechanical".

The following questions refer to bleedings as they occur in the course of an active and too often a progressive tuberculosis. These I call "toxic hemorrhages". I am of the opinion that not only the cause but also the treatment of such hemorrhages may be quite a different thing from those of so-called "mechanical" origin.

III. When a hemorrhage occurs in the course of active tuberculosis:

A. What drugs do you use, if any?

Opinions as to this did not vary from those expressed in answer to the same question concerning hemorrhages of mechanical origin. A few—not over three or four—said that they used little or no medicine; codein was the general favorite and morphine next, while others favored calcium salts, nitroglycerine or serum of some kind.

B. Have you found serum of any value?

To this 17 men out of 26 answered most emphatically "no". A few were doubtful, while Dr.

Swan of Colorado Springs and Dr. Cleaveland Floyd of Boston were the only ones who felt that serums were of value.

C. Do ice bags do any good in such cases?

To this question 9 answered "no" without further comment; a few others answered, as before, that they felt the ice bag quieted the heart as well as the patient and for psychological reasons did good.

D. If the case is suitable, do you advise pneumothorax as soon as possible, or do you prefer to wait?

Fifteen men out of 26 stated that they advised delaying before instituting pneumothorax in such cases; five preferred immediate action whenever possible on the theory that it prevented extension into the rest of the lung and possible broncho-pneumonic complications. The others, quite properly, stated that this would depend largely on circumstances, but that, on the whole, they preferred to wait.

E. With a hemorrhage in the course of active tuberculosis, do you limit the diet?

The answers to this question were approximately the same as to the one I asked concerning diet in the case of a hemorrhage in inactive disease. The majority eliminated hot food and drinks and preferred to restrict the diet to soft solids and liquids.

IV. If a patient with a chronic, inactive tuberculosis, working regularly, has a moderate hemorrhage, do you make him stop his work more than 1-2 weeks and if so, why?

This is a difficult question to answer. If the hemorrhage is a profuse one, treatment is bound to be different from that of a lesser one. Dr. Harry Bray points out that the nature of the individual's work would be the deciding factor, but that, at all events, four weeks' rest would be the shortest time. Dr. Alexius Forster of Colorado Springs, Dr. Jamie Dickie of North Carolina and Dr. John Lloyd of Rochester, New York, feel that the answer to this depends on whether the hemorrhage has produced symptoms of activity. Ten out of twenty answers were to the effect that one or two weeks' rest was usually enough in such cases.

V. Do you feel that hemorrhage of either variety has any relation to sudden severe physical strain?

I have had to give a definite answer to this question in many cases where workmen have had a hemorrhage following violent exertion such as cranking an automobile, lifting a heavy weight, etc. Usually, I have testified before the Industrial Accident Board of Massachusetts to the effect that, while it was perfectly possible the hemorrhage might have occurred in any event, it actually did occur after sudden severe physical strain and that, therefore, it was quite proper to consider the said strain to be a causative factor in producing the bleeding. The answers to this question were of great interest to me. Out of 26 replies, 12 answered definitely in the affirmative; Dr. Metzger said not in the "mechanical" hemorrhage, often in the "toxic" variety; while Dr. James A. Miller said exactly the reverse! Dr. John Lloyd of Rochester, New York, was the only one who said "no". The other opinions were in the affirmative but qualified to a greater or lesser extent.

VI. Do hemorrhages have any relation to emotional or mental stress or strain?

There were 26 answers to this question, 12 in the affirmative, 4 in the negative and the remaining 10 doubtful.

VII. Do pulmonary hemorrhages have any relation to the menstrual periods?

Out of 26 replies, every one, with the exception of that of Dr. Cleaveland Floyd of Boston, was to the effect that there was a definite relation between the menstrual period and a hemorrhage.

VIII. Do you feel that coughing is apt to bring on a hemorrhage?

Out of 26 replies to this question, 19 were definitely in the affirmative, one, from Dr. Browning of Los Angeles, in the negative. The remainder qualified their answers with such expressions as "not as a rule" (Heise) and "occasionally" (Estes Nichols, Parfitt and Pottenger).

IX. What proportion of hemorrhages occur at night or when the patient is resting quietly?

Naturally, there was an immense diversity of opinion in the 26 replies to this question. Many had no figures and apparently no ideas on the subject. Dr. Harry Bray of Ray Brook, Dr. Holden of Denver and Dr. John Lloyd of Rochester called it a "fifty-fifty proposition"; Dr. Parfitt of Ontario, Dr. Paul Ringer of Asheville, North Carolina, Dr. Pottenger of California thought that a still larger proportion, 60-70 per cent., of hemorrhages took place when the patient was at rest. Dr. Gilbert of Colorado Springs and Dr. Estes Nichols of Portland, Maine, said 10 per cent. occurred with the patient at rest, and Dr. Carl MacCorison of Massachusetts, "about one-third". The remainder were uncertain.

As a result of my own experience, I should be inclined to agree with Drs. Bray, Holden and Lloyd that about one-half of the hemorrhages that I have seen took place when the patient was asleep, or at least at rest, and the other half followed some form of activity, mental or physical.

SUMMARY AND CONCLUSIONS

No definite summary or conclusions can be made on such a subject as this except in a most general way. In many cases I would agree with the majority, but in a few striking instances I would strongly support the minority viewpoint. For instance, to 19 out of 26 authorities, a hemorrhage necessarily indicates active disease. To me and a few others it certainly does not.

Apparently, practically all of us are of the opinion that all hemorrhage cases should be reported as tuberculous and the patient or his family so informed.

Opinions as to how long a patient who has had a hemorrhage of any kind should be kept in bed varied from 2-3 days to as many months. Two to three weeks seemed to be about the average.

As to drugs, codein seemed to be the favorite, with small doses of morphia a close second. I was surprised to see so little mention made of atropine.

Icebags were given the value they should have by the majority, which was little or none except in a psychological way.

Concerning diet in hemorrhage cases, a strong minority, with whom I would certainly place myself, felt that the fact that the patient had had some bleeding should not affect his eating what otherwise was suited to his needs.

The majority felt that pneumothorax was a most important method of treatment in hemorrhage cases where the disease was unilateral or nearly so. My own opinion is that pneumothorax is not used nearly so frequently as it should be, especially in those bleedings of "toxic" origin.

In regard to severe and strenuous physical exertion, the majority felt that such unusual exercise might quite properly be regarded as a possible factor in producing a subsequent hemorrhage.

The same applies to the relation of a hemorrhage occurring at the time of the menstrual periods, while the effect of emotional stress and strain in the minds of the majority was doubtful.

Most answers were to the effect that hard coughing undoubtedly played a part in producing bleeding, but, on the other hand, it was felt that a very considerable proportion of all hemorrhages took place when the patient was asleep or resting quietly.

I wish to express my sincere thanks to my friends who have answered my questions so fully in regard to this subject.

STUDIES IN FAT METABOLISM. IV. NEW PROCEDURES FOR QUANTITATING THE ORGANIC PHOSPHORUS IN SMALL AMOUNTS OF BILE*

BY CHARLES W. MC CLURE, M.D.,† ESTHER L. BLOOMBERG, B.S.,† AND MILDRED E. HUNTSINGER, A.M.†

THE present communication is a description of procedures for determining quantitatively the phosphorus content of small amounts of bile. Such determinations are desirable because they furnish indices to the phospholipid content of bile and, as has been discussed in a previous communication[1], the lipids of bile reflect influences of both intra- and extra-hepatic metabolism. For this reason they are potentially of importance in clinical medicine, the fact which furnishes the stimulus for the present investigation.

The organic phosphorus of bile is considered by all observers as present largely in the phospholipids. These are plastic substances which are usually soluble in fat solvents and although insoluble in water frequently form colloidal suspensions. They are classified as phospholipids because their molecule contains both phosphorus and fatty acids in combination with certain nitrogenous compounds; i.e., choline, aminoethyl alcohol and spingosine. These nitrogenous compounds characterize, respectively, lecithin[2], cephalin[3, 4] and sphingomyelin[5]; the three phospholipids whose identity has been established. There is a lecithin[2] and a cephalin[3] for each type of saturated and unsaturated fatty acid found in the body.

"The constant presence of phospholipids in every cell and their retention even in conditions of extreme emaciation make it certain that they are essential for maintaining the vital processes of the animal organism"[6, 7]. Howell[8] has presented evidence that phospholipid, possibly cephalin[7], is an active agent in blood coagulation. Certain degradation products of lecithins, the lysolecithins[9], possess well marked hemolytic properties. Bloor[10] concludes that lecithin is an intermediate step in the metabolism of fats. Sinclair[11] interprets his experimental findings as showing that the phospholipids of the intestinal mucosa play an essential rôle in the resynthesis of absorbed fatty acids into fats. This outlines briefly what little is known of the specific functions of the phospholipids in the body. The more speculative observations of the relation of the phospholipids to the cell membrane are too involved to be discussed in this communication. For such discussion the reader is referred to MacLean[6], Leathes and Raper[12] and Leathes[13].

It has long been established that the liver is rich in phospholipid. Recently Sinclair[11] has

*From the gastrointestinal division of the department of biochemistry, Evans Memorial, Boston.

†McClure—Chief of Gastrointestinal Division of Department of Biochemical Research, Evans Memorial. Bloomberg—Technical chemist to the Department of Biochemical Research, Evans Memorial. Huntsinger—Chemist to the Department of Biochemical Research, Evans Memorial. For records and addresses of authors see "This Week's Issue", page 1118.

made the interesting observation that the fatty acid fraction of phospholipids of the liver changes during fat absorption. Phospholipids are also present in the bile. However, what their function may be or the factors governing their secretion into it are phenomena which have received scant attention. It may be anticipated that the investigation of these phenomena will yield information concerning functional activities of the liver. This is one of the ultimate purposes of the present study of the phospholipid constituents of the bile.

A number of investigators have studied the so-called lecithinphosphorus content of bile. They were interested in analytical methods or in the analyses. A critique of their work is undertaken in another publication[1]. Studies of the significance of the phosphorus content of bile have been made by Grassheim and Petow[14] and by Leites[15]. Grassheim and Petow[14] conclude that the inorganic phosphorus in the bile is not an expression of acid-base changes in the body. Leites[15] concluded that feeding lecithin or olive oil increased the phospholipid content of bile of the normal animal. On the other hand he found it decreased after splenectomy. The status of the methods used by these investigators will be discussed later.

The procedures described in this communication are designed to determine the organic phosphorus content of bile. During their development various obstacles were encountered. One of the difficulties arose from the fact that bile is a complex mixture of such nature as to largely destroy the differential solubilities of its constituents; for example, the bile contains in aqueous medium several substances which are not ordinarily water-soluble. This phenomenon makes the isolation of organic phosphorus compounds so difficult that only an indirect means for their estimation was considered feasible. The method chosen consisted of their oxidation. The large amount of organic matter in bile made this difficult. Not infrequently concentrating a mixture of small amounts of bile and sulphuric acid, a procedure recommended by both Grassheim and Petow[14] and by Leites[15], produced a residue containing so much solid matter as to cause intolerable spattering on attempting digestion by means of heat. The spattering could be obviated by the addition of a sufficient amount of some oxidizing reagents in liquid form. However it was found that such addition usually presented various complications. Likewise, fusion of bile or its extracts in fat solvents proved to be impractical. It was found that 30 per cent. solution of hydrogen peroxide in hot sulphuric acid would oxidize much of the organic matter in the presence of water. The oxidizing power of such a solution is utilized to convert the organic phosphorus to phosphoric acid. The latter is determined by the method of Fiske and Subbarow[16].

An outline of the reagents used in the method to be described is as follows:

30 per cent. hydrogen peroxide. Merck's "Blue Label" "Superoxyl" was found satisfactory. Each lot should be analyzed for its phosphorus content before using. For this purpose 5 c.c. of "Superoxyl" and 2.5 c.c. of 10 N H_2SO_4 are placed in a large Pyrex tube (200 x 25 mm.) the water evaporated and the acid gently boiled. The reagents for developing the color due to phosphorus are added and the volume made up to 50 c.c. This procedure should develop only the faintest trace of blue color.

Molybdate Solution[16]. This is a 2.5 per cent. solution of ammonium molybdate in water.

10 N H_2SO_4[16]. This is prepared by adding 450 c.c. of concentrated H_2SO_4 to 1300 c.c. water.

Phosphorus Standard[16]. This is prepared by dissolving 0.3509 gram of pure monopotassium phosphate in water containing 10 c.c. of 10 N H_2SO_4 the whole equalling a volume of 1 liter.

Reducing Agent[16]. This represents 0.5 gram of 1, 2, 4-amino-naphtholsulfonic acid dissolved in a mixture containing 195 c.c. of 15 per cent. sodium bisulfite and 5 c.c. of 20 per cent. sodium. sulfite.

Redistilled 95 per cent. ethyl alcohol and ethyl ether were also used.

METHOD

Ten c.c. of bile are pipetted into a 100 c.c. volumetric flask, about 70 c.c. of a mixture of equal parts of redistilled 95 per cent. alcohol and ethyl ether added, and the whole well mixed and then made up to the mark with more alcohol-ether mixture. After allowing the flask to stand about 5 minutes the contents are filtered. Five, 10, and 15 c.c. amounts of the filtrate are evaporated to dryness in Pyrex digestion tubes (200 x 25 mm.) by immersing them in boiling water. In order to keep as much as possible of the organic matter near the bottom of the tube no more than 5 c.c. of the filtrate are added to a given tube at any one time. The contents of the three tubes after evaporation to dryness represent the residues from 0.5, 1.0 and 1.5 c.c. of bile. Such varying amounts are desirable because low concentrations of phospholipids may occur in biles obtained from pathologic subjects. The oxidation of the dried residue is completed as follows. To the tube are added 2.5 c.c. of 10 N sulphuric acid and about 1 c.c. of Superoxyl. The tube is then heated on the sand bath until the water has been largely evaporated and the contents have become charred. During the process of evaporation precaution should be taken that in case of foaming the bubbles do not reach the upper half of the tube. If this occurs some of the organic matter may adhere to a region of the tube from which it may possibly not be washed by subsequent procedures. It might thus escape com-

plete oxidation. By the time charring has occurred the major part of the organic matter will have been oxidized in those tubes containing an amount of phosphorus suitable for the final colorimetric determination. From this stage further oxidation may be carried out on the sand bath or over the flame of a microburner. In either event care should be exercised that loss of sulphuric acid fumes does not occur. At this stage the discoloration due to charring is dispelled by the addition of one to a few drops of Superoxyl and heating. Then holding the tube in a clamp its contents are violently shaken so as to wash the walls of the tube as high up as possible. Further discoloration of the digestion fluid will again occur due to the organic matter washed from the walls of the tube. This is oxidized by the addition of a few drops of Superoxyl, and heating. This process of washing the walls of the tube is repeated as long as so doing causes discoloration of the digestion fluid. Then about one c.c. of nitric acid is added, the whole brought to boiling and the walls of the tube again washed by violent shaking of the fluid contents. The acid, which has cooled somewhat due to the process of shaking, is again brought to boiling and shaken again violently to wash the walls. This procedure is repeated several times before the evaporation of the nitric acid. When driving off the nitric acid by heat as soon as the white fumes of sulphuric acid fill the lower portion of the tube their loss is prevented by covering the tube with a watch glass or by inverting into it a small Erlenmeyer flask. Heating is continued until the digestion liquid is but slightly tinged with yellow. After cooling the slight yellow discoloration will completely disappear. Water is next added and the contents of the tube transferred to a 100 c.c. volumetric flask and the volume made up to 70 c.c. with water. Five c.c. of the molybdate solution are now added and 4 c.c. of the reducing agent, the contents mixed and made up to the mark with water and again mixed. At the same time three color standards are prepared by pipetting into 100 c.c. volumetric flasks amounts of the standard phosphate solution containing 0.4, 0.8 and 1.2 mgm. of phosphorus. After standing about five minutes comparisons are made in the Duboscq colorimeter.

Grassheim and Petow[14] and Leites[15] applied to small amounts of bile colorimetric methods which had been devised for the estimation of the phosphorus content of blood. The organic phosphorus of the bile was oxidized with boiling H_2SO_4 and HNO_3. Grassheim and Petow precipitated the H_3PO_4 formed with the well known strychnin-molybdate reagent. Since this method was found[17] to give results widely varying from that of Fiske and Subbarow[16] it was discarded. Leites applied the methods proposed by Randles and Knudson[18] and by Briggs[19]. However, during the present investigation it was found that the oxidation of bile with H_2SO_4 and HNO_3 was accompanied by the formation of picric acid, which renders the oxidized solution sufficiently yellow to interfere seriously with the colorimetric procedure used by Leites. The use of hydrogen peroxide as described in this communication causes no formation of picric acid. The proposed method eliminates another source of grave peril to accuracy, namely, incomplete oxidation due to the creeping of the contents of the tube up its walls above the oxidizing liquid. Obviously, when this occurs complete oxidation can only be accomplished by a procedure which washes the material from the tube's walls, and this is by no means readily done. In the new method proposed the washing of the organic matter adhering along the walls of the digestion tube can be accomplished due to the relatively large amount of hot acid present after addition of the nitric acid.

DISCUSSION

The method described above must fulfill two requirements; i.e., the complete extraction of the organic phosphorus containing compounds present in the bile and the complete oxidation of the organic phosphorus to phosphoric acid. The first of these prerequisites was determined by ascertaining whether organic phosphorus added to bile could be quantitatively recovered. This was accomplished by adding known amounts of lecithin of predetermined phosphorus content to bile and then carrying out the analysis as described both before and after the addition of the lecithin. The results obtained by this procedure are outlined in the following table:

TABLE I

RECOVERY OF ADDED LECITHIN

Specimen	Mgm. of phosphorus per c.c. of bile			
	Original content	Mgm. added	Total recovered	Theoretical amount to be recovered
1	0.23	0.30	0.52	0.53
2	0.00	0.29	0.29	0.29
3	0.25	0.29	0.56	0.54
4	0.07	0.29	0.32	0.36
5	0.45	0.30	0.75	0.75

The results portrayed in the above table show that the organically combined phosphorus added to bile was quantitatively recovered. This demonstrated that oxidation was complete.

The efficiency of the alcohol-ether mixture as a solvent of the organic compounds containing phosphorus was determined as follows: One c.c. amounts of whole bile were pipetted in the digestion tube and oxidized as described in the method. Alcohol-ether extracts of the same specimens of bile were also analyzed. Results representative of those obtained by a series of

such analyses on different specimens of bile are outlined in the following table:

TABLE II

COMPARATIVE DUPLICATE ANALYSES OF THE ORGANIC PHOSPHORUS CONTENT OF WHOLE BILE AND THE RESPECTIVE ALCOHOL-ETHER EXTRACT EXPRESSED IN MGM. OF PHOSPHORUS PER C.C.

Specimen	Mgm. of P per c.c. of whole bile	Mgm. of P per c.c. of the alcohol-ether extract
1	0.66	0.65
	0.66	0.64
2	0.17	0.17
	0.17	0.17
3	0.39	0.37
	0.38	0.38
4	0.15	0.14
	0.15	0.14
5	0.34	0.37
	0.34	0.37

The results given in the above table show that no organic phosphorus compounds escaped extraction. Such extraction has the advantage of facilitating oxidation through the elimination of a considerable amount of the organic matter present in the whole bile. Also, it furnishes a means for separating organic from inorganic compounds of phosphorus.

SUMMARY

A relatively simple colorimetric method has been developed which permits accurate determination of the organic phosphorus content of small amounts of bile.

The authors express their thanks to Dr. B. S. Walker and to Dr. A. W. Rowe for advice and assistance during the progress of the work.

REFERENCES

1 McClure, Charles W., Huntsinger, Mildred E., and Bloomberg, Esther L.: Studies in fat metabolism, III. New procedures for isolating total fatty acids from small amounts of bile and methods for their quantitation. N. E. Jour. Med., 1931, 204, 764.
2 Levene, P. A., and Simms, H. S.: The liver lecithin. Jour. Biol. Chem., 1921, XLVIII, 185. Ibid.: The unsaturated fatty acids of liver lecithin. Jour. Biol. Chem., 1922, LI, 285.
3 Levene, P. A., and Rolf, Ida P.: Cephalin. VII. The glycero-phosphoric acid of cephalin. Jour. Biol. Chem., 1919, XL, 1. Ibid.: Unsaturated fatty acids of brain cephalins. Jour. Biol. Chem., LIV, 91.
4 Baumann, A.: Ueber der stickstoffhaltigen Bestandteile des Kephalins. Biochem. Ztschr., 1913, LIV, 30.
Renall, M. H.: Ueber der stickstoffhaltigen Bestandteile des Kephalins. Biochem. Ztschr., 1913, LV, 296.
5 Levene, P. A.: Sphingomyelin. First Paper. On the presence of lignoceric acid among the products of hydrolysis of sphingomyelin. Jour. Biol. Chem., 1914, XVIII, 453. Ibid.: Sphingomyelin. III. Jour. Biol. Chem., 1916, XXIV, 69.
6 MacLean, Hugh, and MacLean, Ida Smedley: Lecithins and allied substances. Edition 2. Longmans, Green & Co., Ltd., 1927, 167.
7 Levene, P. A., and Rolf, Ida P.: Structure and significance of the phosphatides. Physiol. Reviews, 1921, I, 327.
8 Howell, W. H.: The nature and action of the thromboplastic (Zymoplastic) substances of the tissues. Am. Jour. Physiol., 1912, XXXI, 1.
9 Magistris, Hugo: Ueber die haemolytische Wirkung einiger Abbauprodukte des Lecithins, der Lecithide und Phosphatide. I Mitteilung. Produkte der intermediaren Hydrolyse. Biochem. Ztschr., 1929, CCX, 85.
Delezenne, C., et Fourneau, E.: Constitution du phosphatide hemolysant (Lysolecithin) provenant de l'action du venin de cobra sur le vitellu de l'oeuf de poule. Bull. d. l. Chim., 1914, XV-XVI, series 4, 421.
10 Bloor, W. R.: Fat assimilation. Jour. Biol. Chem., 1916, XXIV, 447.
11 Sinclair, Robert Gordon: The rôle of the phospholipids of the intestinal mucosa in fat absorption. With additional data on the phosphatides of the liver, the stomach and skeletal muscle. Jour. Biol. Chem., 1929, LXXXII, 117.
12 Leathes, J. B., and Raper, H. S.: The part played by fats in the life of the cell. The Fats. Longmans, Green & Co., New York, 1925, Chapter X, 199.
13 Leathes, J. B.: Rôle of fats in vital phenomena. Croonian lectures. Lancet, 1925, CCVIII, 803, 853, 957 and 1019.
14 Grassheim, K., and Petow, H.: Untersuchungen über den Phosphorgehalt der Galle. Ztschr. f. klin. Med., 1926, CIV, 803.
15 Leites, Samuel: Ueber Cholesterin und Lipoidphosphor der Galle; deren Veränderungen bei verschiedener Belastung, nach "Blockade" des retikulo-endothelialen Systems und nach Splenektomie. Arch. f. exper. Pathol. u. Pharmakol., 1928, CXXIX, 108.
16 Fiske, Cyrus H., and Subbarow, Yellapragada: The colorimetric determination of phosphorus. Jour. Biol. Chem., 1925, LXVI, 375.
17 McClure, C. W., and Huntsinger, Mildred E.: Studies in fat metabolism I. The influence on blood lipids of single foodstuffs. Jour. Biol. Chem., 1928, 76, 1. Ibid.: Studies in fat metabolism II. The character of blood lipids in hepatic disorders, including migraine. Arch. Int. Med., 1929, 43, 715.
18 Randles, F. S., and Knudson, Arthur: The estimation of lipoid phosphorus acid ("lecithin") in blood by application of the Bell and Doisy method for phosphorus. Jour. Biol. Chem., 1922, LIII, 53.
19 Briggs, A. P.: Some applications of the colorimetric phosphate method. Jour. Biol. Chem., 1924, LIX, 255.

PHYSIOLOGY OF THE OVARIAN HORMONES*

A Review of Some Recent Literature

BY HENRY S. FINKEL, M.D.†

THE discovery of the female sex hormones and their dominating rôle in the physiology of the reproductive system is one of the outstanding achievements of the present era in medicine. This knowledge has given us a clearer insight into many disorders of genital function, has furnished us with more accurate methods of diagnosis and more specific methods of treatment, and holds forth the promise of much greater enlightenment. The endocrine influence is exerted mainly by three internal secretions: one derived from the graafian follicle, one derived from the corpus luteum, and one derived from the anterior pituitary gland.

*Read at a joint meeting of the Greater Boston Medical Society and the Beth Israel Hospital, at Boston, March 3, 1931.

†Finkel—Gynecologist to Out-Patient Department, Beth Israel Hospital. For record and address of author see "This Week's Issue", page 1118.

THE FOLLICULAR HORMONE

The hormone originating in the graafian follicle is known by several names, of which female sex hormone, estrin and folliculin are most commonly used. The name folliculin seems to be the most appropriate since it indicates the source of origin, just as the names of most of the other internal secretions do: for example, epinephrin, pituitrin, and insulin.

The specific action of folliculin was first demonstrated by Allen and Doisy[1] in 1923, on rats and mice. In these rodents, the estrous cycle recurs at intervals of approximately five days.

The vagina, together with the uterus, undergoes characteristic proliferative and retrogressive changes and the types of cells found in stained smears of the vaginal secretion are a reliable criterion of the phases of the cycle.

The cycle may be described in four stages. During the first stage, called di-estrus, the ovaries contain immature graafian follicles, the uterus is in the resting state, the vaginal smear consists of polymorphonuclear leucocytes. During the second stage, called pro-estrus, the ovaries contain ripening follicles, the uterine endometrium is undergoing proliferation, the vaginal smear is made up of nucleated epithelial cells. During the third stage, called estrus, in which copulation takes place, the ovaries contain mature follicles on the point of rupturing, or already ruptured, the uterus is distended with secretion, the vaginal smear is composed of squamous epithelial cells. During the fourth stage, called met-estrus, the ovaries contain corpora lutea at the site of the ruptured follicles, the uterus is undergoing retrogression, the vaginal smear consists of degenerated squamous cells and fresh leucocytes. If the ovaries are removed, the estrous cycles are abolished, as a result of the withdrawal of the ovarian influence, and the uterus and vagina remain in the resting state. If graafian follicle fluid is then injected into these ovariectomized mice, an artificial cycle is induced, which manifests itself by the successive changes in the uterus and vagina characteristic of pro-estrus, estrus, and met-estrus, with a return to the di-estrous condition after the effect of the injection has worn off.

These facts form the basis of the biological test for folliculin called, after the originators, the Allen-Doisy test. The substance to be tested is injected into ovariectomized mice or rats. If folliculin is present, the cells in the vaginal smear change in approximately forty-eight hours from leucocytes to squamous cells, with a return of leucocytes after the folliculin has been eliminated. The test can also be used quantitatively in terms of mouse or rat units, one unit being the amount of hormone which is just sufficient to give a positive reaction in an adult castrated mouse or rat, respectively. One rat unit is approximately the equivalent of five mouse units.

The application of the Allen-Doisy test has furnished some very interesting information about the sources, distribution and excretion of folliculin in the human. Frank and Goldberger[2] have demonstrated its presence in the circulating blood in fluctuating amounts, reaching its greatest concentration in the pre-menstrual period. With the onset of menstruation the hormone is no longer demonstrable in the blood stream, its disappearance being probably accounted for by its excretion through the menstrual discharge, which contains the hormone in large amounts. The age-long conviction of women that menstruation represents a cleansing of the blood can, be said, therefore, to have a biological justification. Folliculin is also excreted in fluctuating amounts in the urine, reaching the greatest concentration about ten days before an impending menstruation. It is absent before puberty, after the menopause, and in most amenorrhoeic women; in other words, in conditions in which the ovary is not actively functioning. Its quantitative determination in the blood and urine can, therefore, be used as a criterion, to a certain degree, of the functional integrity of the ovaries.

During pregnancy the concentration of folliculin in the blood and urine is enormously increased. It is also found in large amounts in the stools, placenta and amniotic fluid. It is rapidly eliminated following delivery, and can no longer be detected a few days postpartum. The urine of pregnant women contains about ten thousand mouse units per liter, and is being used as a source for the preparation of the pure hormone. The high content of folliculin in the placenta makes it seem probable that this organ is responsible for the greatly increased production of the hormone during pregnancy. This hypothesis is supported by the fact that, following the removal of both ovaries during pregnancy, there is no diminution in the amount of folliculin in the blood and urine.

Considerable progress has been made in the chemistry of folliculin. It is readily soluble in lipoid solvents, such as chloroform, ether, acetone, alcohol and benzol, and can be extracted by these reagents from tissues and fluids. It is resistant to high temperatures, and strong acids and alkalies; but it is destroyed by oxidation. By repeated extractions and purifications it has been isolated by Doisy in the form of a white crystalline substance which is stable, odorless, tasteless, and soluble in water. Its exact chemical structure, however, is still unknown. The purified substance is of such high potency that one gram contains ten million mouse units.

THE LUTEAL HORMONE

Profound as are the changes which folliculin causes, it is not able to reproduce all the phases of the estrous cycle. Studies of the corpus luteum have shown that, in addition to producing folliculin, the ovary produces another hormone whose physiological action cannot be duplicated by folliculin. The changes due to the corpus luteum have been very strikingly demonstrated in the rabbit. In this animal the estrous cycle proceeds spontaneously only up to the point of maturation of the follicles. Ovulation does not occur, however, except after the stimulus of coitus, at which time the follicles rupture and the corpora lutea form. During the period of follicle ripening the endometrium undergoes some proliferation under the influence of the folliculin liberated by the follicles. A few days after the formation of the corpora lutea, however, the endometrium undergoes a

more marked growth, called progestational proliferation, because it prepares the uterus for the nidation of the ovum. The progestational proliferation takes place whether or not fertilization has occurred. This reaction, in a non-fertile cycle, is spoken of as pseudo-pregnancy, because of the resemblance to the changes of early pregnancy. If the ovaries of a rabbit are removed shortly after impregnation, the progestational changes in the uterus do not occur, and, as the result, the embryos degenerate and are aborted. The final proof of the specificity of the corpus luteum hormone was furnished by Allen and Corner[3], who were able to bring about the progestational changes and continuation of pregnancy, in animals whose ovaries had been removed, by injections of a corpus luteum extract. Allen and Corner have suggested the name "progestin" for this hormone because of its protective function in gestation. The name, "lutin", however, which indicates its origin, seems more appropriate. In addition to causing the progestational changes in the latter part of the estrous cycle, lutin has other physiological effects. During the active life of the corpus luteum the process of maturation in the graafian follicles is inhibited, and the contractility of the uterus is depressed. Uterine muscle, which usually responds to the stimulus of pituitrin with a marked contraction, is unresponsive to pituitary stimulation during the luteal phase. Lutin also has a growth-stimulating effect on the gland tissue of the breast, causing further hypertrophy than the follicular hormone is capable of producing.

The function of lutin, therefore, is the preparation of the uterus for the nidation of the ovum, the preparation of the breasts for lactation, and the protection of the developing embryo. Lutin is incapable of producing its specific effects unless the tissues have been previously prepared by the presence of folliculin. If the injection of lutin in an ovariectomized rabbit is delayed until the animal's folliculin has been eliminated, the progestational proliferation of the endometrium does not take place. Folliculin and lutin, therefore, are complementary; folliculin is responsible for the changes in the organism up to the time of copulation and fertilization; lutin brings about the further changes necessary for the continuation of pregnancy.

THE ANTERIOR PITUITARY HORMONE

While the ovary is responsible for extensive changes in the genital system, it is, in turn, subject to profound influence from another gland of internal secretion, the anterior pituitary. In 1926, Aschheim and Zondek[4], and Smith[5] independently made the important discovery that the implantation of anterior pituitary gland in infantile white mice and rats stimulates the ovaries so powerfully that follicle maturation, ovulation, corpus luteum formation and intrafollicular hemorrhage result. The anterior pituitary from males or females is equally potent in this respect, indicating that this gland is not sex-specific. The non-functioning ovaries of senile mice can also be reactivated by the same procedure. From these experiments Aschheim and Zondek concluded that the anterior pituitary gland produces a hormone which is responsible for the onset of ovulation at puberty, and for the cyclic activity of the ovary. They also found that the injection of pregnancy urine produces the same changes as anterior pituitary gland in the ovaries of infantile mice, and they utilized this reaction as a diagnostic test for pregnancy. I have carried out this test with 98% accuracy in 150 cases in which the diagnosis of pregnancy was clinically doubtful. In many of these cases the diagnosis was made as early as one week after cessation of menstruation. In one case of ectopic pregnancy the diagnosis was made three weeks after the last period, or one week before the anticipated catamenia. A few days after delivery, or after death of the foetus in utero, the reaction becomes negative. The test can be used, therefore, to establish the diagnosis of death of the foetus in cases of known pregnancy. Hydatidiform mole and chorio-epithelioma, two conditions which represent degenerative disease of the chorion, without the presence of an embryo, both give strongly positive reactions. This leads to the supposition that the placenta is probably the source of this hormone during pregnancy, just as it is also the source of the follicular hormone.

The chief drawback to the Aschheim-Zondek test is the delay of four days necessary for its completion, which makes it impractical for those acute cases in which a quick diagnosis is important, as in bleeding cases and in question of extrauterine pregnancy. This drawback has been overcome by the work of Friedman[6], who discovered that the formation of corpora lutea and corpora hemorrhagica could be precipitated in the adult rabbit in twelve hours by a single intravenous injection of five cubic centimeters of pregnancy urine. Schneider[7, 8] using immature rabbits, obtained similar results in twenty-four hours. I have used rabbits for the diagnosis of pregnancy in thirty-five cases thus far with uniformly correct results.

Removal of the ovaries in animals results in hypertrophy of the anterior pituitary and an increase in its gonad-stimulating potency. In women, after removal of the ovaries, or after spontaneous cessation of ovarian function, as in the menopause, anterior pituitary hormone can frequently be detected in the blood and urine. In these women, only the follicle maturation reaction is present, and not the luteinization reaction, which is characteristic of pregnancy only. Aschheim and Zondek believe that these two reactions are the result of two distinct anterior

pituitary hormones (Prolan A and Prolan B), while others regard them as quantitative variations. Since removal of the ovaries results in increased activity of the anterior pituitary, the conclusion has been drawn that the ovaries exert an inhibitory action on the anterior pituitary.

Anterior pituitary hormone, in contrast to folliculin, is very unstable. It is destroyed at a temperature of sixty degrees, and by strong acids and alkalies. It is insoluble in alcohol and can be precipitated from pregnancy urine by the addition of four parts of ninety-five per cent. alcohol. From the precipitate thus formed the hormone can be redissolved by the addition of water. In this way it can be concentrated to any desired degree.

MENSTRUATION

The phenomena of menstruation can best be understood by correlating them with the estrous cycle. The regeneration of the endometrium after menstruation corresponds to the pro-estrous stage and coincides with the maturation of the graafian follicle. Ovulation occurs about fourteen days after the preceding menstruation and corresponds to the estrous stage. The copulatory instinct, or "heat", which is associated with this stage in animals is not apparent in humans, however. After ovulation the corpus luteum forms, and under its influence the premenstrual proliferation of the endometrium takes place, corresponding to the period of pseudo-pregnancy in animals. As involution of the corpus luteum takes place, menstruation sets in. This phenomenon has no counterpart in the estrous cycle, except in primates, in whom a similar condition occurs. The vaginal cycle, which is so prominent in rodents, has also been detected in humans by means of sections removed at different periods during the cycle, but it is not apparent in vaginal smears.

After the discovery of the stimulating effect of folliculin and lutin on the endometrium, the theory was advanced that menstruation was the result of the withdrawal of these stimulating effects as involution of the corpus luteum took place. This theory has been discredited, however, by the demonstration that menstruation can take place in monkeys without the occurrence of the ovulatory cycle, and, consequently, without the premenstrual hypertrophy of the endometrium. Furthermore, Hartman[9] has shown that menstruation can be induced in ovariectomized monkeys by the injection of anterior pituitary hormone. It seems, therefore, that menstruation is precipitated by a periodic action of the anterior pituitary gland directly on the uterus. The explanation of the periodicity of this action is still obscure. In some way it is dependent on the presence of the ovary, since ovariectomy causes cessation of menstruation, but it is not dependent on the ovulatory cycle, since menstruation can occur without ovulation. It is possible that the non-ovulating ovary produces sufficient folliculin to intermittently inhibit and release the anterior pituitary secretion. This hypothesis is supported by the fact that injection of folliculin in ovariectomized monkeys is followed by menstruation, but injection of folliculin in hypophysectomized monkeys is without effect.

THERAPY

The therapeutic potentialities of folliculin, lutin and anterior pituitary hormone are not yet well established. The older desiccated preparations of these glands have all proved inert by the biological tests now available. Potent preparations of folliculin, biologically assayed, are now available, however, and favorable results from their use have already been obtained. Folliculin has been used for the relief of the distressing symptoms of the menopause. It has also been used in hypofunctional conditions, such as absence of menstruation, scanty and irregular menstruation, and sterility. Its effectiveness in these conditions is probably due to an indirect action on the ovaries through the medium of the anterior pituitary, rather than to a direct action on the uterus. The proper dosage is not yet well established. Thousands of units have been given without harmful effects. It is probable that many therapeutic failures are due to inadequate dosage.

Potent preparations of the anterior pituitary gland and the corpus luteum are not yet generally available, but it is expected that they soon will be. Anterior pituitary therapy has been applied by subcutaneous implantation of fresh anterior pituitary glands. Blood transfusion from a pregnant woman has been utilized as a means of introducing both folliculin and anterior pituitary hormone.

In this paper I have attempted to present as much of the subject as can be encompassed in so brief a time. Of necessity, it has been impossible to cover the ground completely. If I have shown, in broad outline, the present status of our knowledge, my purpose has been achieved. While much has been accomplished, there is much more that remains to be discovered. We are just on the threshold of a more enlightened view-point in the diagnosis and treatment of functional disorders of the female reproductive system.

REFERENCES

1 Allen, E., and Doisy, E. A.: An ovarian hormone. J. A. M. A. 81:819-821, Sept. 8, 1923.
2 Frank, R. T., and Goldberger, M. A.: Clinical data obtained with the female sex hormone blood test. J. A. M. A. 90:106-110, Jan. 14, 1928.
3 Allen, W. M., and Corner, G. W.: Physiology of the corpus luteum. Am. J. Physiol., 88:340-346, March 1929.
4 Aschheim, S., and Zondek, B.: Hypophysenvorderlappen und Ovarium. Arch. f. Gynäk., 130:1-45, 1927.
5 Smith, P. E.: Hastening development of female genital system by daily homoplastic pituitary transplants. Proc. Soc. Exper. Biol. & Med. 24:131-133, Nov. 1926.
6 Friedman, M. E.: Mechanism of ovulation in the rabbit. Am. J. Physiol., 90:617-622, Nov. 1929.
7 Schneider, P. F.: A hormone test for the diagnosis of early pregnancy. Surg. Gynec. & Obst., 52:56-60, Jan. 1931.
8 Schneider, P. F.: Ovulation in the rabbit as a diagnostic measure in early pregnancy. Proc. Soc. Exper. Biol. & Med., 28:117-119, Nov. 1930.
9 Hartman, C. G., Firor, W. M., and Geilung, E. M. K.: Menstruation and the anterior pituitary. Proc. Soc. Exper. Biol. & Med. 28:185-187, Nov. 1930.

A CASE OF PURPURA WITH UNUSUAL NECROPSY FINDINGS*

BY HERBERT POLLACK, M.D.†

THE patient, a single white American woman 58 years of age, entered the New England Baptist Hospital July 3, 1928. Her chief complaints were blood in the stool, abdominal pain, and loss of weight. The x-ray diagnosis was diverticulitis; proctoscopy was negative. She was re-admitted September 4, 1929 with an interval history of urticaria, abdominal discomfort, tarry stools and loss of strength. An x-ray diagnosis of marked colitis was made. Hospital treatment relieved her symptoms. Blood studies at the time showed 85% hemoglobin (Tallqvist); 4,270,000 R.B.C.; 7,400 W.B.C.; with 70 polymorphonuclear leucocytes, 22 lymphocytes, 5 large mononuclear leucocytes, and 3 eosinophiles. (No remark on platelets.)

The patient was re-admitted December 6, 1929, with a mass the size of a hen's egg in the right lower quadrant. The x-ray studies showed questionable malignancy of the cecum. On December 7, 1929, a resection of the cecum and terminal ileum with lateral anastomosis of the ileum and transverse colon was done.

The gross description of the excised portion of intestine (No. 7063) was as follows: A cecum with 3 cm. of terminal ileum. The entire cecum is markedly thickened, tough and porky, composed of pale gray tissue, 0.8 to 1.4 cm. thick. The muscle coats can be distinguished to some extent. The mucosal surface is injected with small foci of necrosis, covered with grayish-brown shaggy material. These foci are shallow ulcers, irregular in outline, up to 1.0 cm. in diameter. They are less marked toward the hepatic flexure. The remainder of the mucosal surface is somewhat injected but otherwise normal.

Microscopic examination revealed an edematous gut wall with a large amount of scar tissue in the submucosa. The mucosa was deeply injected, in places ulcerated and replaced by granulation tissue heavily infiltrated with lymphocytes and scattered polymorphonuclear leucocytes. There were scattered polymorphonuclear leucocytes and monocytes in the submucosa and edematous muscularis. There were foci of lymphocytes in the deeper portions of the submucosa. The essential picture was that of a non-specific type of colitis, either subacute or possibly acute, superimposed on chronic. The microscopic diagnosis was ulcerative colitis.

This is not the typical form of necrotic ulcerative colitis, both from the standpoint of the histological examination and from the relatively normal condition of the remainder of the gut as determined at autopsy.

The remainder of the peritoneal cavity was essentially negative.

The patient's convalescence for two days following the operation was smooth. Late in the afternoon of the third day she developed purpuric spots on her cheeks and both ears. By midnight she went into collapse and was transfused with but temporary help. Another transfusion was done the next morning, following a second period of shock. The subcutaneous hemorrhagic areas increased in size and extent.

Blood studies at this time showed: hemoglobin 88%; 6,328,000 R.B.C.; 34,200 W.B.C.; 36,000 platelets; icteric index 12; reticulocytes 1.2%; mean diameter R.B.C. 7.7 microns. Differential count: polymorphonuclear leucocytes 95%, lymphocytes 1.5%, large mononuclear leucocytes 3.5%. A further remark states: "Platelets clearly decreased in number, though there are fairly large clumps. In most of the clumps the platelets appear fixed and disintegrated, possibly the transfused platelets." (Blood studies by Dr. R. Larrabee.)

The patient died in the afternoon of December 17, 1929. An autopsy was performed 3½ hours after death. A summary of the findings is given below:

BODY: On malar aspects of both cheeks, chin, ears, supraorbital and subconjunctival regions, and on upper right arm at site of hypodermic injection are brawny, raised, purplish spots varying from 3 to 6 cm. in diameter with pinkish borders not sharply demarcated from surrounding tissue.

HEAD: Hemorrhage under scalp over occipital bone where head had been in contact with a pillow.

PERITONEAL CAVITY: Recent adhesions between operative wound and ileum, ascending colon and omentum. These are easily broken. Light pressure on ileum causes bubbles of gas to come through entero-enterostomy. Subserous hemorrhages are seen on surface of lower three feet of ileum, ascending colon, sigmoid and rectum, posterior surface of bladder, anterior surface of uterus. Pelvic well is full of almost pure blood. Omentum is tightly bound by adhesions to several diverticula in descending colon and sigmoid. Subperitoneal hemorrhages in parietal peritoneum in region of operative incision.

PLEURAL CAVITIES: Right pleural cavity contains 25 c.c. of almost pure blood.

HEART: 260 gms. Moderate amount of epicardial fat. Right auricle distended. Myocardium fairly firm, reddish-brown. On section shows area of hemorrhage in interventricular septum about 3 cm. from auricular ventricular septum. Endocardium negative. Coronaries negative.

LUNGS: Right voluminous, crepitant, usual anthracotic markings. Cut section negative. Left somewhat smaller than right but crepitant. In lower left lobe is a wedge-shaped, black, firm focus with apex toward center of lung. Bronchi clear.

SPLEEN: Less than 10 grams. 6 cm. long, 1 cm. at widest point, and 0.8 cm. at thickest. Surfaces wrinkled and gray. Cut section pale red with pinpoint white markings quite numerous. Splenic artery and vein are quite small and in proportion to size of organ.

GASTRO-INTESTINAL TRACT: Mucosal surface of stomach negative. Stomach contains about 200 c.c. of greenish cloudy fluid. Intestines contain yellow fecal material down to lower portion of ileum where they are deeply blood stained. Mucosal surface in lower ileum and colon is purplish-red and roughened with adherent bits of fibrin. Mesentery showed considerable hemorrhage in fat. Entero-enterostomy necrotic, tissue very friable, and leaked before any chance of postmortem traumatic manipulation. Gut wall very friable, particularly in neighborhood of enterostomy. Blind end of ascending colon tightly closed. Wall thickened up to 1.5 cm., firm, pale gray, inelastic tissue. Numerous small diverticula seen in transverse and descending colon and sigmoid. Description of serosal surfaces given under peritoneal cavity.

URETERS: Left ureter 2 cm. from pelvic brim

*From the Laboratory of Pathology, Palmer Memorial Hospital, Boston, Massachusetts.

†Pollack—Interne in Pathology, Palmer Memorial Hospital. For record and address of author see "This Week's Issue", page 1118.

shows purplish discolored area 1.5 cm. long, which on section proves to be localized submucous hemorrhage. Lumen, however, is patent. Right ureter shows same process but much more extensive, involving practically whole abdominal length of tube. Lumen also patent.

BLADDER: Posterior bladder wall contains subserosal hemorrhage. On section submucous hemorrhage involving mouth of urethra and adjacent mucous membrane for 4 cm. in diameter. Bladder wall between submucous hemorrhagic portion and subserosal hemorrhagic portion grayish-white. Definite demarcation between the two hemorrhagic surfaces. Urethra shows some submucous hemorrhages throughout its entire length.

GENITALIA: Anterior wall of uterus shows subserous hemorrhage. Cervix negative. Endometrium negative. Ovaries atrophic. Tubes have subserous hemorrhage.

VEINS: Ante mortem thrombi completely occluding lumen were found in inferior and superior mesenteric veins, left hypogastric vein and right external iliac vein. Left external iliac vein contains a mural thrombus which does not completely occlude lumen.

ARTERIES: Thrombi completely occluding inferior and superior mesenteric arteries.

MICROSCOPICAL EXAMINATION

HEART: Focus of hemorrhage into myocardium. Congestion and thickening of vessels. Slight fibrosis.

LUNGS: Intense congestion. Focus of necrosis and hemorrhage. Second section the same.

SPLEEN: Capsule wrinkled and folded in microscopical gyrations. Trabeculae occupy practically whole of organ. Blood sinuses diminished in quantity. Vessels are thrombosed and recanalized and are quite large for size of organ. One lymph follicle found in section. Amyloid stain negative.

LIVER: Diffuse albuminous degeneration. Round cells in periportal spaces. Organized clots in occasional vessels.

OMENTUM: Considerable hemorrhage with fibrin and polymorphonuclear leucocytes. Necrosis of omental tissue. Clots in vessels. Hyaline thickening of vessels. Marked subintimal fibrin deposits in vessels. Fibrin organization in vessels.

GASTRO-INTESTINAL TRACT: Extensive necrosis of gut. Polymorphonuclear infiltration throughout with fibrin deposits. Ante mortem thrombi in vessels. Marked plasma and round cell reaction in submucosa. Periserosal tissue necrotic; infiltration with polymorphonuclear leucocytes and fibrin. Second section shows extensive hemorrhage throughout all layers of gut. Ante mortem thrombi in vessels. Third section the same as first.

ADRENAL: Focus of capillary hemorrhage. Focal necrosis.

BLADDER: Hemorrhage in submucosa and muscularis. Ante mortem thrombi throughout. Muscularis contains some fibrin and polymorphonuclear leucocytes. Hyperplasia of epithelium of bladder.

INFERIOR MESENTERIC ARTERY: Completely occluded by ante mortem thrombus showing early organization.

VEINS: Also occluded. Beginning recanalization.

SKIN: Many ruptured capillaries.

MUSCLE: Extensive capillary hemorrhage with slight loss of striations in many fibers.

BONE MARROW: Normal.

Cultures of the heart's blood taken under sterile precautions three and one-half hours postmortem showed no growth under aerobic and anaerobic conditions in twenty-four hours. A portion of the blood was injected into the hind leg of an Albino guinea-pig. This produced a rapid local suppuration with extensive necrosis of the muscles and subcutaneous tissue. A bacillus, which was gram-positive, short and spore-bearing, was cultured from this abscess. The organ was an obligate anaerobe. On blood agar plates, anaerobically the colonies appeared shining white, 1 mm. in diameter and slightly raised in center. No hemolysis in twenty-four hours. No gas produced on sugars. By animal transfer through several guinea-pigs the virulence was raised to such an extent for these animals that the pigs died in eighteen hours with subcutaneous and subconjunctival hemorrhages.

This case presents an unusual feature of purpuric signs, associated with extensive thrombosis, peritonitis and phlegmonous inflammation of the gut wall. The general picture suggests overwhelming infection with an extremely virulent organism, possibly gaining access to the tissues through the region of the operative incision. The purpuric lesions produced in guinea-pigs by the organism recovered from the blood at postmortem are suggestive.

I wish to thank Dr. A. A. Hornor for permission to publish the clinical data.

ETHYL-IODIDE IN EAR, NOSE, AND THROAT

Report of Observations

BY JOSEPH PRENN, M.D.*

WHILE at school, the teacher in Theory and Practice told us: When in doubt what to prescribe, think of KI. His teacher gave the same dictum to his class.

So far, the records of iodine (and iodides) medication, based on chemical and laboratory observations, tell us that it is a: 1. solvent, 2. alterative. Like all drugs, it has a predilection for certain tissues. In this case, it is the inflammatory exudate and diseased cells, both acute and chronic. Its action is due, not to antisepsis, but "to its ability to destroy the antitryptic power in the blood and allow the proteolytic ferments to dissolve any degenerated or necrotic tissue". It stimulates leucocytosis, both local and general. Exerting its influence this way, a more active absorption and elimination of tistue waste (catabolism) takes place. That is one of the reasons why the thyroid gland is so important to the normal process of metabolism.

Because iodine has a definite place in the latter and its function is to dissolve diseased cells

*Prenn—For record and address of author see "This Week's Issue", page 1118.

and get rid of them, the more the body needs it, the greater the tolerance. It is said that as soon as a luetic begins to show signs of intolerance to iodides, everything being equal, it is a sign of improvement. That is also the reason why children with proportionally higher metabolism have equally greater tolerance for iodides.

When iodides are administered, they are found, in a large percentage, in the inflammatory tissue itself, such as gummata, tuberculous glands, and any other suppurative tissue. As a solvent, it diminishes viscosity and increases secretion. It is contraindicated in moderately advanced tuberculosis because it will dissolve and prevent fibrosis.

We can readily see that there is a broad field for iodine in certain diseases of the ear, nose, throat, and bronchial tree. To apply it directly for its local benefit would be the quickest and most direct method. But iodine, as such, is an irritant to the mucous membrane. Even when used in dilute form, as iodo-glycerine, its inaccessibility to certain parts without instrumentation, and sometimes elaborate ones, makes it impractical. Such would be the case in the eustachian tube, tympanic cavity, and bronchial tree. Besides, to get proper local effect, we should have to use a sufficient amount of iodine which is an irritant.

In the volatile ethyl-iodide, the apparatus and method of which have been described in another issue of this *Journal*[1], we have an iodine in evanescent state which can be used to good advantage. Breathing the ethyl-iodide through the mouth and exhaling it through the nostrils, we get a general diffused application of iodine to the mucous membrane of the entire tract through which the air courses. For its application to the eustachian tube, one may use the Valsalvian method to introduce the iodized air.

The air ordinarily goes in and out of the tympanic cavity through the eustachian tube with each inspiration and expiration.

This is readily demonstrated in patients who have had a perforation but was covered by a thin scar tissue either naturally or provoked. One can see in such a case the thin membrane move in and out during the ordinary process of respiration.

It is said that the iodine works best in a mixture of oxygen and CO_2.

It might be best to execute one or more treatments in the office first, and let the patient use it at home, coming back to check up on the progress, dosage, and frequency of administration. One patient, who is on the last of his third ounce, refilling it and using it at home, feels better, has a healthier color and better resistance. He apparently needed iodine and he got it by its local application improving the tone of his nasopharyngeal mucosa plus its absorption by the pulmonary circulation.

This patient I operated on several years ago with a good deal of anxiety. He was tall, slim, nervous, anemic, with a delicate, rose-colored flush on his cheeks; was always tired and had no resistance. I did anterior turbinotomies on him and drained his sinuses. He has improved a great deal since the operation, but the mucous membrane of his nose and throat and his general condition have shown a marked improvement since he began using ethyl-iodide.

The following cases will show the apparently definite action of ethyl-iodide and the changes in pathology it produces.

A young, healthy-looking man was referred for nasal obstruction, frequent nosebleed on the slightest provocation, and headache. On examination, the mucous membrane of his nose was rather turgescent, with large casts in the upper posterior part of his nose. No ozena. The careful insertion of a small pledget of cotton soaked in nupercain to desensitize and shrink the mucous membrane caused bleeding, and so did the removal of the cast. The casts stuck to the blades of the forceps and could be removed with difficulty. There was a small polyp between the left middle turbinate and outer wall. This condition the patient had had for years. Transillumination of antra and left ethmoids and frontals was slightly opaque. Wassermann was negative. We were apparently dealing here with a devitalized mucous membrane including its capillary walls with a perverted secretion with a resulting sinusitis. Septum and turbinates were negative.

It was not deemed advisable to operate until the tone of the mucous membrane had been improved and the casts had been removed. Their mechanical removal and the application of mercurochrome, while it helped somewhat, did not prevent the formation of casts of the same consistency. He was put on 1 cc. ethyl-iodide. After two inhalations at the office, the patient began to use it at home; first, 15 drops once daily, and soon 25 drops once every other day. The bleeding diminished in frequency and amount and stopped. The mucous membrane became less turgescent and healthier, and the casts first became smaller with a soft mucous base so they could easily be detached without bleeding, and on several examinations there were no casts. The patient was then ready for operation. On suction of the antra, a syringeful of dark blood was drawn out from the right antrum, and a half syringeful from the left antrum. The cavities were then irrigated with 1% warm Dakin's and drained them again by suction. The left ethmoid cells were broken down and the granulation removed. There was no bleeding after operation.

2. This patient is a school-teacher who was referred for laryngitis on account of which she has had to stay out of school. Examination showed an infantile epiglottis like an extremely curled leaf and very much congested so that a good view of the larynx was difficult. She also had some pharyngitis and rhinitis. She was put on 1 cc. ethyl-iodide. The laryngeal examination could then be made much more easily. She had in all two laryngeal applications of 5% $AgNo_3$ and four inhalations of ethyl-iodide. The last inhalation the patient suggested.

This case, one of the first, shows that ethyl-iodide has a local anaesthetic effect upon the mucous membrane and does not irritate and provoke coughing when properly taken.

Several patients who, in addition to catheterization of the eustachian tubes and mobilization

of the drum membranes, had also had the above inhalation, followed by the Valsalvian method, have reported improvement and stated that they felt more comfortable. It is interesting to follow up the effect of ethyl-iodide inhalation on the patency of the eustachian tube and of its dissolving adhesions as can be demonstrated on mobilization.

I have since used ethyl-iodide inhalation, through the above-mentioned inhaler, for tracheitis, in a child eight years old.

The results were satisfactory. Two inhalations were taken. She slept through the night without coughing after the first inhalation. The child said that it felt softer and easier right after the inhalation.

I have written to the Merck Chemical Co. to put in the solution one of a few vehicles, to camouflage the taste. They have promised coöperation.

REFERENCES

1 Prenn, Joseph: The new inhaler. New Eng. J. Med. 202: 1156, June 12, 1930.
2 Pharmaco-Therapeutics, Solis-Cohen.
3 Prenn, Joseph: Suction and irrigation apparatus for the diagnosis and treatment of the antrum of Highmore. Boston M. & S. J. 173: 432, Sept. 16, 1915.

TRANSPLANTATION OF THE GALL BLADDER*

Preliminary Report

BY WAYNE J. STATER, M.D.†

IN June 1930, I reported in *Northwest Medicine* some projected experiments on the transplantation of the gall bladder into the abdominal wall. The experiments which we are reporting at this time were begun in the summer of 1930. They were suggested by my discovery of a gall bladder cyst of the abdominal wall in a patient who had had a cholecystostomy, and, later a cholecystectomy and choledochostomy performed for a persistent biliary sinus. The report of the cholecystic cyst of the abdominal wall was published in *Northwest Medicine* in June 1930, where photomicrographs of the excised tissue may be found.

On February 4, 1931, a specimen in vivo of a transplanted gall bladder (which lay just beneath the skin as a bulging tumor in the abdominal wall) was shown before the Portland City and County Medical Society.

On March 11, 1931, I presented a paper on the transplantation of the cholecystic viscus before the same Society. At this time a specimen in vitro of a successfully transplanted gall bladder was exhibited, together with microscopic sections of the transplanted organ. This gall bladder had been transplanted several months previously. In this case about three-fourths of the parent organ had been transplanted. A postmortem examination on the animal showed that death resulted from pancreatitis.

These experiments were performed on dogs and further work is being conducted. At the present time we have a number of successfully transplanted gall bladders into the abdominal parietes.

The transplantation of the gall bladder is carried out in two stages. During the first stage of the operation the gall bladder is freed from the liver bed down to the cystic pedicle and the fundus is then sutured into the abdominal wall. At the second stage, several weeks later, a distal segment of the gall bladder, consisting of about one-fourth to three-fourths of the entire cholecystic viscus, is excised from the proximal portion of the parent organ. Its contents are evacuated and the lumen is then closed. Any amount of gall bladder tissue may be transplanted and variable portions of this viscus have been selected in the different animals. This segment of the gall bladder, freed from its connections with the bile radicals, original blood supply, nerves and lymphatics, exists as a closed cavity with an acquired blood supply, a cholecystic cyst. It is now sutured into the abdominal wall, usually external to the muscles so that it lies just under the skin, but any locus in the wall may be selected or it may be allowed to project into the peritoneal cavity. The proximal or remaining portion of the gall bladder is excised and the wound closed.

In order to learn whether the denervation and separation of the gall bladder from its original lymphatic and blood supply and connection with the biliary radicals would affect or alter the secretions of its mucosa, another set of experiments are under way to elucidate this point. In this set of experiments I have begun by partially separating the fundus of the gall bladder in its distal portion from the liver. This was done to bring the fundus out into the abdominal wall where it is sutured. The cystic duct is doubly ligated and divided between the ligatures, in order that the gall bladder might form a closed cavity without any connection to the bile radicals. The cystic duct is the only structure of the cystic pedicle that is disturbed. The gall bladder is now a closed cavity reaching outside of the muscles of the abdominal wall, being su-

*These experiments are being conducted in the physiological laboratories of the University of Oregon Medical School.

†Stater—For record and address of author see "This Week's Issue", page 1118.

tured, first to the peritoneum and later to the fascia.

With this work completed we may study the transplanted gall bladder in many ways, since, it may be seen with the eye as a bulging tumor just under the skin, palpated with the fingers, and tapped with a needle as desired. The secretions of this segment of the gall bladder are now available for study but have not been carefully worked out in the past on account of the anatomical location of the organ. On the other hand substances may be introduced to determine which ones are absorbable, and the rate of this process. The effects on this viscus of drugs introduced into the organism orally, subcutaneously, intravenously, or otherwise may be observed and recorded in a suitable manner. Any movements of the viscus may be observed by palpation or inspection after the skin is incised or by placing suitable apparatus within the cyst which is connected with suitable recording equipment. The effects of mechanical, electrical, chemical and other stimuli may be determined.

What concentration of sodium tetraiodophenolphthalein or allied drugs in the gall bladder is necessary in order that it may be recorded in x-ray films, producing cholecystograms? What concentration of these drugs is found in the normal bladder after they have been presented in the usual manner? What is the concentration of these substances in the normal gall bladder at various intervals after their introduction? These problems draw our attention and an effort is being made to establish norms. If an authoritative standard can be worked out, any variation from the normal may be more easily noted and recorded.

At the present time we are interested in finding out whether the cells of the mucosa of the transplanted gall bladder have a selective action for sodium tetraiodophenolphthalein or allied drugs, that is to say, we wish to observe whether these cells will take up these substances from the blood stream in sufficient quantities to cast a shadow on x-ray films. The dye is given in the usual manner and x-rays are taken at intervals but a fat meal is not presented.

What is the reason for such a copious blood supply to the gall bladder? The ease of its transplantation demonstrates that only a small part of it is necessary for the nourishment of the viscus. No doubt the concentration of the bile requires part of the extra blood supply as does the formation of its secretions but other factors may play some part. In studying this problem certain data may be acquired by ligating only the blood vessels of the gall bladder in the cystic pedicle. Before this procedure is carried out the dogs are given sodium tetraiodophenolphthalein by stomach tube and cholecystograms are prepared. After the ligation of the vessels this test is repeated. Thus certain information may be obtained about the concentrating function of the gall bladder. It is to be noted that the lymphatics of the gall bladder are not disturbed by this method. Only those that accompany the blood vessels are interrupted.

If the concentration of the bile is due to the filtration of the fluids of it through the walls of the gall bladder into the lymphatics or venous circulation, it would be interesting to determine which of the latter plays the only or most important rôle in this connection. We are attempting by the following plan to throw some light on this subject. Normal dogs are selected and cholecystograms are prepared in the usual manner. Now as many of the lymphatics of the gall bladder as possible are interrupted, leaving only the cystic duct and blood vessels of the cystic pedicle intact. The lymphatics between the gall bladder and liver are interrupted by the separation of the gall bladder from the liver down to the cystic pedicle. Then, all tissue of the cystic pedicle is incised except the cystic duct and blood vessels. The gall bladder is now rotated slightly either to the right or left beyond the liver bed of the organ and its raw surface is loosely sutured to the peritoneal surface of the liver. After the animal has recovered the dye is administered in the same manner and cholecystograms are prepared, if possible. It may be possible to interrupt only the veins in the cystic pedicle leaving the other structures intact, and, then, repeat the above experiment. After a further study of the veins and lymphatics of the gall bladder by injection experiments, the value of this procedure will be reported.

The gall bladder secretes mucus which is partially transparent and difficult to withdraw by tapping the transplanted viscus. A study of the character and rate of production of the mucus is being carried out. The gall bladder probably secretes ferments. The rapid disappearance of the gall bladder mucosa after its removal or after death suggests this. If it be true that calcium stones have been found in the gall bladder in cases of congenital obliteration of the bile ducts, the gall bladder probably secretes calcium.

THE SPRING MEETING OF THE HARVARD MEDICAL ALUMNI ASSOCIATION

ON April 17 and 18, more than six hundred of the alumni of the Harvard Medical School gathered at Vanderbilt Hall to attend the spring meeting of the Harvard Medical Alumni Association. Most of those present were from New England but there was a fair representation from more distant states. An interesting program was arranged under the direction of Dr. Francis M. Rackemann, President. It consisted, on Friday, of many short discussions on selected subjects by men of prominence. Saturday morning was given over to visits at the various hospitals where special clinical exercises were held and inspection of the various research laboratories encouraged.

The meeting was officially opened at 9 A. M. Friday morning by Dr. Rackemann in the gymnasium at Vanderbilt Hall. After a word of welcome and an explanation of the program he introduced Dr. David L. Edsall, Dean of the medical school, whose subject was "Certain Aspects of Medical Teaching." The address was based on interesting observations and efforts now being made in attempting to overcome those faults in educational policies whereby the student is not given enough individual consideration.

The first opportunity which the school has in solving this problem is in the selection of the men entering the first year class. From the many applicants the committee chooses the outstanding men as evidenced by the available information. This information is summarized with especial attention to scholarship, the quality of the student in his relation to outside activities, his personality, and in addition the evidences of qualities necessary for leadership.

An analysis of a group of students in this respect has been very satisfactory.

The effort to study the individual is carried on throughout his four years in medical school. Within a week after entering, the entire class is interviewed by members of a group of twelve men who attempt to evaluate the characteristics of each student. During the last few years it has been the policy of the school to have each member of the teaching staff write a brief report of each student coming under his observation. These are not conventional analyses but rather impressions of the student as an individual. This has proved to be very instructive in that certain men with excellent marks are deficient in some dependable characteristics while men with very poor marks frequently receive good reports from the standpoint of individual promise.

The school has also so arranged the schedule that the student has more free time. Following this, the use of the school library increased 100% in three years and there are other evidences which show that more real studying is being done.

The tutorial system, which gives the fourth year student, of superior standing, an opportunity to spend part time working along special lines, has also proved very satisfactory.

At the conclusion of Dr. Edsall's remarks Dr. Elliott P. Joslin spoke on "The Treatment of Diabetes with a Demonstration of Cases." In a delightful and informal way Dr. Joslin presented a group of his patients who illustrated some of the unusual aspects of diabetes as well as the optimism which the patient and physician should have in attempting to control the disease. Few patients under forty years of age die of diabetes; only 13 such succumbed in Boston during 1930. The mortality during the fifth decade has not changed however while that for the sixth decade and above has increased. The problem of diabetic coma in children confronts the physician as a preventive condition which requires energetic, intelligent treatment.

The more interesting cases presented were:

1. A boy who required 700 units to emerge from coma in contrast to another child whose diabetes was first diagnosed in coma and who recovered with 28 units of insulin.
2. A woman of 73 years who had lived longer with diabetes than the average individual lives without it and therefore received a medal. Despite her age she had survived a prolonged surgical operation with avertin anesthesia.
3. A woman of 83 years who was so spry that she played the piano for the audience.
4. A woman with diabetes of 21 years' duration, beginning at the age of 17 years, who discredited a fatal European prognosis and has a healthy child 16 years old.
5. A border-line diabetic of 15 years' duration with three children who successfully withstood a partial gastrectomy for a neoplasm at the age of 43 years.
6. A healthy appearing school mistress with diabetes of 9 years' duration who is, so far as known, the first living case to be reported of a *calcified pancreas* with calcified vessels of the legs. Treatment with insulin was begun in 1927 with subsequent gain in weight of 45 pounds. Diet: Carbohydrate 112 grams, Protein 73 grams, and Fat 120 grams. Insulin 24-0-20. Her blood cholesterol values obtained since treatment began have always been low. The most recent cholesterol value is 67 mgms. per 100 c.c.
7. A man of *thirty* years with sensory neuritis and gangrene of the toes.

One could not leave such a discussion and unusual demonstration without realizing that dia-

betes is a condition which can be controlled, does not prevent the sufferer from meeting successfully the emergencies of life and above all does not prevent him from leading a normal, happy, useful existence.

At 10:30 Dr. Walter B. Cannon spoke on "A Contrast of Old and New Teaching Methods in Physiology"; "A Brief Account of Some Recent Physiological Investigations." Dr. Cannon has long been connected with the Medical School as the Professor of Physiology and his observations on the changes that have taken place in the teaching of that subject were interesting. The students now do more of their experimental studies on mammalians and humans than in the days when the use of the frog, gave the course the familiar name of "frogology". The efforts, too, are towards a greater correlation of the clinical and laboratory work. Formerly students wrote a thesis in Physiology, based on reading of original records of investigators. This plan has been altered so that now the student finishing the second year is required to write a thesis on some general subject which requires integration of the work of the first and second years.

For several years Dr. Cannon has been interested in the study of the autonomic nervous system in relation to certain glands of internal secretion. This study has been done on the denervated heart which is very sensitive to changes in the blood, especially the amount of adrenalin. Observations showing the difference in reaction of the body, before and after denervation of the adrenal glands, in conditions of low body temperature and hypoglycaemia, illustrated some of the functions of the sympathico-adrenal system.

Dr. Cannon then related the story of the discovery of Sympathin which is a hormone-like substance given off from smooth muscle and simulating adrenalin in its action. Its presence was suspected when a mysterious rise of pulse rate was noted in studying the denervated heart. After a long series of experiments in which every structure of the body, connected with the autonomic nervous system, was ruled out as the causative factor, it was found that stimulation of smooth muscle fibers was the cause. While neither adrenalin nor sympathin is vital for life, they are concerned, in coöperation with the sympathetic system, with the regulation of the fluid matrix or internal environment of the body.

Dr. Cannon concluded his talk with motion pictures of laboratory animals showing the effects of partial and complete removal of the sympathetic nervous system.

Following this demonstration the group went to the Peter Bent Brigham Hospital, where Drs. Harvey Cushing and Henry A. Christian conducted a clinic.

The afternoon session was held in the gymnasium with Dr. Elliott P. Joslin presiding. The following program was given.

2:00 P. M.

The Present Status of Cardiac Surgery

BY DR. ELLIOTT C. CUTLER

There are four conditions of the heart where surgery may be indicated. These are (1), trauma; (2), acute and chronic pericarditis; (3), angina pectoris; (4), mitral stenosis.

Urgency has been the stimulus in the treatment of wounds of the heart by surgical procedure. The significance of the cardiac wounds was not appreciated until the principle of cardiac tamponade was elucidated. When this principle was applied the mortality decreased and at present is about 25%.

In acute pericarditis, surgical intervention is necessary when there is an embarrassment of the heart action by the accumulated fluid and when frank suppuration exists. In chronic pericarditis, attempts to remove the restraining effect of the rigid chest wall are in order. Perhaps more important than this factor is the presence of cardiopericardial adhesions which restrict the heart action and which can be removed by a process of decortication.

The surgical treatment of angina pectoris is based on the hypothesis that pain originating in the heart traverses the central nervous system and is referred outward over the peripheral sensory nerves. The treatment consists in interrupting these paths. This was first done by Jonnesco, who secured relief by the removal of the three cervical and first thoracic ganglia of the sympathetic chain. It was later found that removal of the superior cervical ganglia, alone, produced the same result. Equally good results have obtained by the injection of the sympathetic rami with alcohol following a therapeutic test with novocaine.

The application of surgery to mitral stenosis is based on the principle that mitral regurgitation is more compatible with life than mitral stenosis. The method consists in the enlargement of the mitral orifice by means of a valvulotome introduced through the ventricle. Dr. Cutler has performed this operation on six cases. One of these survived four years with improved cardiac function. The other five died within six days, not as the result of the operative procedure, but of complications.

2:20 P. M.

The Treatment of Anemia

BY DR. GEORGE R. MINOT

The adequate treatment of anemia necessitates removal of the cause whether proximate or remote, with attention to all aspects of a given case. The dependence to a greater or less degree

of many cases of anemia upon inadequate nutrition, either resulting from inadequate diets or indirectly conditioned by a defect of the individual, makes the study of this aspect of the problem of primary importance.

Adequate treatment of pernicious anemia is not by liver, kidney, stomach, pancreas, brain or potent preparations from these organs but by enough potent material, irrespective of its source, for the given individual throughout life. One must know the potency of the material and the amount taken by the patient. Extract derived from 100 grams of liver is not, within 30 or more per cent., equal in potency to the ingestion of 100 grams of liver. Likewise, often 30 per cent. of liver substance is lost in preparing this food, so that what is bought is by no manner of means the amount ingested.

It is usually a simple matter to initiate a remission. Failure implies an incorrect diagnosis, an improper dose or severe complications. Unusually large doses are required occasionally. Sometimes difficulty in absorption or utilization of a potent product occurs and then if given intravenously dramatic results may follow. The maintenance dose varies widely. It takes distinctly more potent material to maintain the red blood cells at a level above 5 million per cu. mm. than for example at a level of 3.8 million per cu. mm. Larger doses are required in older than younger individuals, when cardiovascular disorders occur, and in the presence of infection and other complications. The object is to make not only all aspects of the blood normal, but the patient himself as well as possible. Symptoms and signs are as important guides to dosage as the state of the blood. The treatment of the lesions of the nervous system seems best carried out by administering, with regularity large amounts of potent material not merely the amount that maintains a normal blood level. More material should be given when neurological symptoms cease to lessen or tend to progress. Perseverance with maximal amounts is imperative. Retraining exercises and other simple procedures should not be neglected. The principle of supplying optional quantities of effective substances in order to maintain the best possible health must be strictly followed rather than merely supplying enough material to maintain definite improvement.

Occasionally in pernicious anemia the supplementary addition of iron may improve the blood especially when an unsuitable diet has been taken for a long time or chronic blood loss has occurred.

Castle's work clearly demonstrates that it is not achlorhydria that causes pernicious anemia but the lack of a particular factor secreted by the normal stomach, not hydrochloric acid, pepsin, rennin, or lipase.

The principles in the treatment of anaemias that can respond to iron are essentially the same as those for pernicious anemia. There are various sorts of so-called "secondary" anaemias that can be alleviated by iron in suitable doses (large rather than small), especially anemia due to chronic blood loss, various dietary defects, gastro-intestinal disorders and pregnancy. Cases of ill-defined anaemia and cases of chronic microcytic anemia of obscure origin with achlorhydria, which occur especially in women, can also be influenced definitely by iron in large amounts. Infections and complications inhibit the action of iron so that brilliant results cannot be expected in anemias of infectious origin. There are undoubtedly patients with simple hypochromic achlorhydric anemia who must continue to take iron with regularity, and apparently for the rest of their lives, or relapses will occur.

Liver contains many substances other than the active principle effective in pernicious anemia. Usually the extracts for pernicious anemia are not effective except in megaloblastic anemias and many patients with "secondary" anemia have wasted time and money in taking such products. Whole liver has a remedial effect in anemia due to chronic blood loss. Whipple has obtained a fraction of liver distinct from the substance effective in pernicious anemia that enhances hemoglobin regeneration in anemia due to blood loss. Iron alone cannot make hemoglobin; it cannot supply the loss from the body of material necessary for hemoglobin function. Certain foods can do this. The addition of liver to the diet of patients benefited by iron can sometimes accelerate blood regeneration especially as the hemoglobin approaches normal.

The diet of each patient with anemia must be carefully considered and individually prescribed or the adequate treatment for anemia will not be given. There is need for a wider appreciation of the fact that anemia can often be wholly or partially related to the partaking of an unsuitable diet for a period of years. A carefully obtained and detailed history concerning the patient's dietary habits throughout life often will suggest a reason for anemia and can lead to the selection of an appropriate diet. The part played by chronic digestive disorders in altering blood formation is always a matter for study.

Temporary gross dietary deficiencies do not produce significant symptoms, but departure from an optional diet, even if slight, can produce ill health when operative over a long period of time and especially if combined with digestive disorders. Every phase of each case must be properly treated and the patient must never be neglected.

The "shotgun" prescription of large amounts of liver and iron offer the greatest chance for improvement to the anemic individual, but this procedure does not lead to an understanding of the importance of the different factors and such routine treatment leads to neglect of all aspects of the given case.

2:40 P. M.

Blood Analysis, Its Present Status and Applicability

BY DR. OTTO FOLIN

The laboratory procedures used in studying the blood should be simple enough for the practitioner and accurate enough to give research data. In determining the nitrogen in the blood it was found, that, after certain known constituents, i.e., uric acid, urea nitrogen, creatinine and amino acids, were eliminated there was still a nitrogen deficit of one-third. With improved technical methods using hypertonic solutions, to prevent the laking of the blood cells, this has been reduced to an unimportant factor. What is the best single determination for the physician to use as a criterion of nitrogen retention? Uric acid is the most difficult product for the body to eliminate and should give the earliest evidence. However it may be destroyed in the body and thus give the most unreliable information. The small amounts of creatinine in the blood make the technical difficulties of this procedure too great. The non protein nitrogen and urea nitrogen determinations are the most useful. Of these the former is preferred, because the likelihood of technical error is less.

The normal non protein nitrogen is now believed to be around 20 mg. per 100 c.c. and values of 25 are indicative of some nitrogen retention.

It has been thought that the kidneys must be damaged to a considerable extent before evidence of nitrogen retention is manifested because of the factor of safety provided by the kidney. Very slight damage to the kidneys is followed by an increase in the nitrogenous content of the blood. My opinion is based on the observation that changes in the nitrogen content of the diet produce changes in the nitrogenous elements in the blood.

3:00 P. M.

Field Studies in Acute Respiratory Disease

BY DR. WILSON G. SMILLIE

A small mobile unit has made a field study of the bacteriology and epidemiology of common colds, as well as the normal respiratory flora in individuals living in isolated places. Studies have been made in Happy Hollow in southern Alabama, in Northwest River, Labrador, and in St. John, one of the U. S. Virgin Islands in the West Indies. The unit is now making a year's study of the same subject in Spitzbergen.

Nasopharyngeal cultures are made of normal persons and of individuals with colds during the various seasons of the year. Environmental factors are determined and records kept of contact with the outside world. The study is an attempt to determine the effect of various environmental and other factors upon the incidence and course of acute respiratory disease.

3:20 P. M.

The Place of Nephrostomy in the Management of Surgical Conditions of the Kidney

BY DR. HUGH CABOT

Nephrostomy as ordinarily used is applied either to kidneys which have been the seat of obstruction with or without infection and to kidneys in which infection is the outstanding lesion. Many of the patients with kidney obstruction for whom operation must be considered will have some type of nephrolithiasis. As a rule the question of whether such a kidney should be treated by nephrectomy or by removal of the stones with drainage will be determined by one's estimate of the functional capacity of the kidney. But, unfortunately, estimation of kidney function in the presence of renal calculi is notoriously unreliable, and this is to a considerable extent also true of the kidneys showing obstruction from some other cause, even though investigation of the kidney by ureteral catheter and x-ray is entirely possible.

I desire therefore to point out that it is difficult or impossible to arrive at any reliable conclusion in advance of operation as to the possibility of preserving a kidney by relieving the obstruction and instituting drainage. For this group, therefore, nephrostomy will often be found desirable in view of the conditions actually found at operation.

Another very important consideration in deciding what cases should be treated by nephrostomy is an estimate of the extent to which renal function may be expected to recover when satisfactory drainage has been instituted.

Hinmann in 1922 and 1926 published some very important experimental work under the title "Renal Counterbalance." This study brought him to the conclusion that when obstruction to the outlet of one kidney had occurred and had continued for a sufficient length of time to give rise to hypertrophy of the kidney on the other side, then relief of the obstruction and drainage of the affected kidney would commonly or generally be followed by atrophy. He concluded that a kidney damaged by obstruction and working in competition with a hypertrophied kidney on the other side capable in and of itself of taking care of the whole renal function could not be expected to regain function and would be likely to become a total loss.

These conclusions have seemed to me at variance with clinical experience. A valuable study by Jolson, Beck, and Morris in 1929 seemed to deny the soundness of Hinmann's conclusions.

My own clinical experience points to the fact that a damaged kidney working in competition

with a hypertrophied one will show improvement of function as the result of drainage and will as a rule not go on to atrophy, thereby retaining for the patient a valuable amount of kidney tissue.

Nephrostomy may also be found desirable in that not uncommon group of patients with bilateral renal lithiasis in which operation has not seemed desirable unless or until the time arrives when the total kidney function is insufficient to carry on the work of the body. At this point bilateral nephrostomy will, I believe, improve kidney function, and in certain cases should be made permanent and will prolong comfortable and useful existence for a number of years.

I wish at this time to point out that permanent nephrostomy on one or even on both sides is by no means incompatible with social comfort and economic activity. I think it not improbable that its wider employment may prolong many useful lives. It will thus appear that I believe nephrostomy has a considerably wider field than has been generally believed and that by the use of a technic which has recently been developed, the operation can be made to show a very low mortality and a very satisfactory functioning over a long period of time.

3:40 P. M.

Host Factors in Pneumococcal Pneumonia

BY DR. FRANCIS G. BLAKE

The morbidity of pneumococcal pneumonia, like that of other infectious diseases, is determined in large part by three factors: (1) the pathogenic properties and the virulence of the organism; (2) the opportunities for infection; and (3) the host factors of susceptibility and resistance. The first two factors have been studied in great detail and much has been learned about them. On the other hand, the third factor has received relatively little attention. Consequently, it has seemed desirable to attempt an analysis of host susceptibility with the hope that additional knowledge might be obtained which would indicate the part which host factors play in morbidity.

In order to do this it has been necessary first to study the morbidity of pneumococcal pneumonia due to each one of the different types of pneumococcus, inasmuch as no data concerning morbidity exists at the present time. This has been done at the New Haven Hospital for a period of ten years and the morbidity rates for each type have been analyzed particularly with relation to age distribution. The results show that the morbidity rates for Type I and Type II pneumonia are highest in childhood; for Type III pneumonia in old age; and for Type IV in infancy. When these facts are correlated with the known differences in likelihood for infection with the different types, it becomes clear that susceptibility to Type I and Type II pneumonia is much greater, probably at all ages except infancy, than it is either to Type III or Type IV. Susceptibility to Type III is greater than to Type IV, except in infancy.

An attempt has also been made to find a measure of individual susceptibility to pneumococcal pneumonia by determining the agglutinin content of the blood serum of individuals of all ages for an avirulent pneumococcus lacking type specificity. The curves constructed by determining the ratio of those with high to those with low serum antibodies at different age periods were found to be mirror images of the morbidity curves. These observations together with certain others, still of a preliminary nature, indicate the probability that the antibody content of the blood against the common pneumococcus protein, may be a fairly accurate measure of active immunity and suggest the perhaps dominant importance of host factors in determining the occurrence of pneumococcal pneumonia.

4:00 P. M.

Disease a Biological Problem*

BY DR. THEOBALD SMITH

Looking upon disease as a whole we can define it as the result of disturbances of equilibrium between living organisms and their environment. These disturbed conditions may be left to right themselves or we may interpose corrective efforts in a way that appears to be advantageous in combating the antagonistic invasions of disease.

Examples of this disturbance of equilibrium between the human race and nature are numerous, thus, "the greatest strain of world equilibrium is overpopulation with the result of forcing into extinction many species of animals and many species of plants which originally shared the continents with man". The resulting conditions are constant threats of biological upheavals of great danger to large dense populations. "Disease is thus a biological entity, conjured up by the herding and domesticating factors of civilization." Adjusted in one place it crops out in another, and the main difficulty of medicine is to deploy its forces fast enough or for the individual doctor to adjust himself, rapidly enough, to the unexpected developments and the new methods necessary to understand and meet them.

*These few incomplete references to Dr. Smith's address will show the importance of his reasoning to human problems and lead to devoting time to the perusal of the full address, which will appear in the *Bulletin of the Harvard Medical School.*

Nature and man are constantly trying to restore these disturbed balances of disease, but their methods are frequently far apart. The contributions of bacteriology enable man to see disease as a mass of biological reactions and not a mere state of degeneration.

In all activities focused on the problem of disease we find in competition for dominance the urge to control and the desire to know and understand. One activity attacks directly and is often repulsed with losses and retires to give the other a chance to study more thoroughly the next attack. These two forces have created two fields of work, practice and research, one of which we are forced into. The function of research is to dissect and to analyze and it "takes living processes to pieces and tries to make the pieces operate while the rest of the unknown machinery is kept under control".

"One of the difficulties of medical science and practice is the shortness of life's span compared with the indefinite time limits of the problems undertaken."

Many precious, undeveloped or partly developed fragments are lost with the individual life. This loss makes it almost impossible to evaluate the possibilities for ill due to continued action of what are trifling injuries. Even if this knowledge were available, the problem must still be attacked in nature's way or in man's way which tends to bend all procedures to his advantage. However, man's defenses are only artificial structures and it is impossible to emerge from the influence of natural law. "History tells us of civilizations one after another, rising, declining, and disappearing. For a time each was able to hold its own against natural law, then lost its grip and perished."

Natural law tends to reduce disease by moving backward towards the more primitive existence under which the race and its antecedents were developed. The temporarily dominant race attempts to continue its mode of life and to fight disease by using various artificial and substitutive measures. Preventive medicine and public health agencies are outgrowths of this. They attempt to give mass protection for humanity against the biological law. It is important that these defenses be adequate, efficient and able to meet the ever-increasing forces which are antagonizing them.

The infectious and parasitic diseases are still the largest problems before the human race. That the microbic agents are ever present and ready to enter the body, when its resistance is lowered, is evidenced by the great epidemics starting from some isolated community or sources outside the race. To state that the infectious diseases are overcome gives false security for when resistance is lowered, "the same conquered plagues will appear just as nature enters an abandoned field and covers it with forest growth".

The problem of finding the last cases is the most difficult aspect of present-day attempts to eradicate completely or annihilate certain infectious diseases. Nature has made it more difficult by developing races and varieties of organisms which under certain conditions may rise to the original level of virulence or become unresponsive to diagnostic methods. Resistance possessed by the race, made up of natural selection, transmitted passive resistance from parent to offspring and continuing exposure to infection, tends to disappear. Thus the last cases may act as sparks in a dry field.

Suppression and vaccination against a few diseases, rigid delimitation, suppression and exclusion against the bulk of diseases, seem, at present, to be the methods most applicable for man to use to preserve his dominance. The price is high but the present course of social evolution demands it and eternal vigilance coupled with constructive thought of a high order should give the proper impulses for action.

The progress in the biological direction has been steady and will be enhanced if students are taught "to think biologically, in terms of natural law, especially if the usual expression of that law must be circumvented in the interests of the human race".

HARVARD MEDICAL ALUMNI ASSOCIATION DINNER

Especially interesting features of the meeting were the exercises at and following the dinner in Bowditch Hall at the dormitory on Friday evening. Dr. Francis M. Rackemann presided.

Dr. A. Lawrence Lowell, President of Harvard University, was the first speaker and discussed some of the problems of medical education. The difficulties associated with the process of medicinal education are partly due to the enormous amount of knowledge involved and to the rapidity with which it is increasing. It is not practical in medicine to continue adding new knowledge to the old and teach it all. The tendency now is to reduce the number of courses and to teach the fundamentals, thus, enabling the student to adapt himself to the changing conditions and to group and assimilate the new knowledge.

Another change is the disappearance of a mere didactic attempt to furnish a man with information. It is self information that makes a man competent. He must form his own pattern and learn to fit facts to this conception and to utilize them. The ability of the student to think and to correlate his knowledge of all subjects, is the final criterion of the success of the process of medical education.

Following President Lowell, Dr. Edsall, Dean of the Medical School, again addressed the session concerning changes in the school. In 1910

Harvard was predominantly a New England school with sixty-four per cent. of the student body from this area. However there has been a gradual change and today sixty-three per cent. of the student body comes from states outside of New England. During this same period the per cent. of honor students from New England has dropped from seventy-six per cent. to twenty-seven per cent. which indicates that only men of superior quality are seeking entrance from distant states.

At present there are one hundred and seventy-nine men connected with the school who have attained some prominence in the field of medical advancement. These men are scattered throughout the faculty in positions of primary and secondary importance.

In discussing the disposition of the funds of the school Dr. Edsall pointed out that in 1918 the laboratory departments were given seventy-four per cent. of the available departmental funds while the clinical branches received only twenty-six per cent. Today that has been reversed and the clinical branches in the year 1931-32 will receive sixty-one per cent. of the total funds.

There are several departments, needing both personnel and funds, which are not yet up to the standards of other departments. However the future is very bright if the school can avoid the dangerous attitude of complacency and go forward with the same vigor that has characterized the past two decades. It is very important that the same high standard of personnel be maintained. These men must be selected according to their ability to teach and to contribute to the progress of their subjects. The present status of the ability to stimulate and train others is appreciated when one knows that there are at present 244 men, who were students of the school or had advanced training here, who are in professional positions in other schools.

The last speaker of the evening was Dr. William S. Thayer, Professor Emeritus of Medicine, Johns Hopkins Medical School.

The advancement, which Dr. Thayer has observed during the forty-three years since his graduation, has been due to the ability to call on and employ more accurate methods. It has been due to a program so arranged that the head of a department may give his time to a subject and be surrounded by a staff of highly trained men who can take up any aspect of a given problem and give even years of study to it. This university unit gives the men in active practice an opportunity to come in and study. It allows, too, for the man who gives years of intensive study to a problem, without much teaching, to contribute his portion to the general advancement of medical education.

To be a teacher or physician demands experience. The fundamental training is necessary but, too, the student must be taught to palpate, to listen, to see, to elicit signs and above all to reason from a physical standpoint. With a thorough understanding of the physical problem involved he can correlate his knowledge of physiology or pathology. It is important that the student should see examples of all the common diseases. This actual contact with a disease cannot be replaced by reading about it.

Dr. Thayer feels very strongly that the present four-year graded course is abnormal and fundamentally wrong. It is too much like the high school system. His ideal would be a school where the student could study medicine according to his own aptitudes and ability. More independence is desirable and the student should spend his time as he will, study as he sees fit and take his examinations when he is ready.

The following officers were elected for the ensuing year:

President: Dr. William C. Quinby.

Vice-President: Dr. William B. Breed.

Secretary: Dr. James M. Faulkner (re-elected).

Treasurer: Dr. Augustus Thorndike, Jr. (reëlected).

Council: Dr. Francis M. Rackemann, Dr. William H. Robey, Dr. Walter Phippen.

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 17211

FEVER, EMACIATION AND SECONDARY ANEMIA WITHOUT KNOWN CAUSE

MEDICAL DEPARTMENT

A married New England housewife of sixty entered March 7 complaining of anorexia, loss of weight and numbness of the feet.

In May, nine months before admission, when she was as usual feeling in good health, she began to have gradually increasing fatigue and loss of energy. After two months she found it difficult to work the long hours to which she was accustomed. Her nose became obstructed and sore. By the advice of a physician she stopped eating candy, which she particularly craved at the time, and took Seidlitz powders with apparent relief. Two weeks later she went to another physician complaining of stiffness and pain in the elbows, knees, wrists and ankles. She urinated once at night. Examination showed enlargement of the phalangeal joints, tenderness and enlargement of the right wrist with a little distention and enlargement of both knees, which were purplish. The heart sounds were clear. There were no murmurs. The blood pressure was 180/80. Her appetite, which had previously been very good, was becoming poor and she was losing weight. Five months before admission she and all her family had "pink eye". A physician treated her for iritis, for which he could find no specific cause. On examination her weight had fallen from 168 pounds at the onset to 135. The muscles were flabby. There was marked iritis of both eyes. The heart and lungs were normal. The Wassermann was negative. The blood pressure was 160/90. She was given two injections in the arm as part of the treatment for iritis. She felt weaker than ever and had practically to give up work. Three months before admission she noticed numbness and coldness of the feet, severe cramps in the legs and a throbbing sensation. If she stood for any length of time her ankles would swell. She continued to lose weight. She was given cinchopyrine, 5 grains every three hours. Two and a half months before admission examination was as before except that there was a slight trace of albumin in the urine and the blood pressure had dropped to 130/80. On January 3 she reported again complaining of cramps in the legs and of sore mouth. Examination showed stomatitis and weight 119½. The cinchopyrine was discontinued.

Seven weeks before admission she was sent to a hospital, where the following findings were recorded: "Temperature 101°, pulse 100. . . . Eyes showed marked conjunctivitis. Both pupils dilated and irregular. . . . Mucosa of mouth studded with white patches which, when membrane removed, revealed small red ulcers. There was marked ulceration of the gums. . . . Heart normal. Blood pressure 130/80. Ulcers on anterior surfaces of both legs, ragged outline and some discharge. Same type of ulcer around anus. . . . Blood: red cells 3,529,000, white cells 13,200 with 70 per cent polynuclears, 3 per cent eosinophiles, 27 per cent lymphocytes. Blood sugar 80. Smear from mouth showed pneumococcus and staphylococcus, no Vincent's organisms. Lumbar puncture showed no block, alcohol slightly positive, Wassermann negative. Stools February 15 positive for blood, while on March 5 they were negative. Course in hospital from admission to January 23: Patient ran a fever varying from 100° to 101°. It was felt that this could be explained by the stomatitis present. On January 21 the seven remaining teeth were removed and the temperature became normal. Under treatment with dionine and boric acid compresses to the eyes the ocular condition cleared up. Neurological examination on January 26 showed normal reflexes in the lower extremities, but there was some inhibition of sensation. Touch sensation was intact. Pain sense was acute, but on examination with heat and cold there was some dissociation extending up from the toe to the calf region. There were what was considered a trophic ulcer in the perineal region and healing ulcerations of the lower legs. February 15 the patient had some edema of the right leg. Examination showed nothing that could explain this. . . . Her weight had varied from 117 to 118 pounds."

For the past ten days the patient had felt nauseated during and after meals and had vomited several times. She thought that at least part of the nausea and vomiting was due to medicine she was using on her gums. She had had gas for some time but no change in her regular bowel habits. She had lost fifty pounds in nine months.

The family history and marital history were negative.

She had malaria forty-six years before admission, swelling of the knees for the first time thirty-seven years before admission and pneumonia fifteen years before admission.

Clinical examination showed a poorly developed, emaciated woman with marked pallor of the skin and mucous membranes. All the muscles were flabby. There was general glandular enlargement with most of the glands shotty but with one gland the size of a walnut in the left

axilla. A shotty gland was felt in the left supraclavicular region. The tongue was not atrophic. The heart was slightly enlarged to the left with a soft systolic murmur at the apex. The radials were palpable but not markedly sclerotic. The blood pressure was 134/74 to 144/80. There were inconstant râles without other signs at the left apex behind. Questionable slight fullness was visible on the right side of the epigastrium on respiration. The tip of the spleen and of the left kidney were just felt on deep respiration. There was a healed pigmented ulcer of the medial surface of the left tibia. On the lateral surface of the right malleolus was the scab of a small healing ulcer. There were purpuric spots over both lower legs, the back of the knee and the anus. The dorsalis pedis pulsation was good. There were Heberden's nodes and swelling of the finger joints. The ankle jerks were not obtained. There was no response to plantar stroking. The other reflexes and the neurological examination were negative except for diminished position sense in both feet, more in the right foot, absent vibration sense on the right foot and diminished on the right ankle and the left foot, diminished sensation to pinprick over the outer surface and on the sole of the right foot and diminished temperature sensation over the external surface of the right foot, the lower third of the right leg and the sole of the left foot. Touch sense was normal. There was no perianal anesthesia. The right pupil was larger than the left. Both reacted well. The fundi showed arteriosclerotic changes, a few fresh flame-shaped hemorrhages around the macula of the left eye and one moderate sized subhyaloid hemorrhage in the left eye.

The urine at entrance showed a specific gravity of 1.016, a trace of albumin, 2 to 5 leukocytes and 15 to 20 red blood cells. Blood examination showed 3,300,000 red cells, hemoglobin 55 per cent, 7,000 white cells, 69 per cent polynuclears. The entrance smear showed moderate achromia, some variation in size and shape. The platelets were normal. Color index .8. March 16 the smear showed atypical granulocytes. Two Hinton tests were negative. March 11 the basal metabolic rate was plus 34 (pulse 84, weight 49.9 kilograms). March 12 the rate was plus 30, March 14 plus 15. A lumbar puncture done March 11 gave clear colorless fluid, initial pressure 160, no block, ammonium sulphate and Wassermann strongly positive, Pandy positive, total protein 34, cells 5 lymphocytes, 5 red blood cells, sugar 58.8, colloidal gold 0001111000, culture no growth. The blood chemistry March 11 showed the non-protein nitrogen 38 milligrams, the chlorides 595, the plasma protein 6.5 per cent. March 19 the non-protein nitrogen was 88, the creatinin 2.6. The fasting contents of the stomach were 70 cubic centimeters of mucoid alkaline material, total acidity 5. The test meal at half an hour showed free hydrochloric acid 49, total acidity 56. At one hour the hydrochloric was 34, the total acidity 39. Guaiac on all three specimens was negative.

The temperature was 96.4° to 100° until March 15, afterwards 99.8° to 100.6° to March 16, afterwards 101° to 104°. The pulse was 85 to 138. The respirations were normal until March 18, afterwards 22 to 41.

X-ray examination showed the esophagus, stomach and duodenum not remarkable. There was no six hour residue in the stomach. 80 or 90 per cent of the barium, however, was in the ileum at the end of six hours. There was no evidence of disease in the chest. There was marked atrophy of the lumbar vertebrae. The first lumbar appeared to be narrowed. A second examination confirmed the findings in the vertebrae. The first lumbar was definitely narrowed and wedge-shaped. There was no evidence of bone destruction. The joint spaces above and below were preserved. There was no soft tissue thickening. The findings were suggestive of a compression fracture. The kidney outlines appeared normal in size, shape and position. There was some retained barium in the colon five days after the barium meal. There were no shadows suggesting stone. The lower dorsal and lower four lumbar vertebrae, the upper part of the pelvis and the lateral view of the skull showed no evidence of metastatic malignancy. A small oval area of calcification was however seen just above and posterior to the sella turcica in the lateral view of the skull. There was no evidence of increased intracranial pressure in the skull. Further study of the skull was suggested. A barium enema passed the cecum without delay. The colon was low and redundant. There was no evidence of an organic lesion.

A neurological consultant thought the patient had neuritis secondary to the cause of the anemia, etc., and thought the normal spinal fluid protein and the absence of sphincter disturbance made a cauda or conus lesion due to malignancy unlikely. A urological consultant thought pyelography was indicated. A skin consultant reporting March 18 found the ulcers all healed. He thought the negative Hinton and the strongly positive spinal fluid did not seem to fit together and advised checking the latter report. An eye consultant found lenticular opacities of the right eye, vitreous opacities of the left eye, the discs apparently normal, but considerable arteriosclerosis of the retinal vessels.

March 16 the patient had pleuritic pain in the left lower chest with an audible pleural friction rub, so cystoscopy was postponed. She had very severe lumbar puncture headache. March 17 and 18 she had follicular tonsillitis, vomiting, a temperature of 104° by rectum and seemed very ill. The white cell count was 19,600. The chest was clear. March 19 without previous symptoms

she had a right sided tonic and clonic convulsion involving the face and arm, with conjugate deviation of the eyes to the right, lasting four minutes, not associated with any biting of the tongue or loss of sphincter control. For the rest of the day she was confused, incontinent of urine and did not talk clearly. Examination after the attack showed the right arm reflexes and the right knee jerk to be greater than the left. The increased right knee jerk had been noted the day before. The white blood cell count was 4,150. March 20 she had two similar attacks. The general condition and the physical examination were unchanged. There were no abnormal reflexes. The abdominals could not be elicited. The temperature was still 104°. The urine showed a trace of albumin, 10 to 20 white cells and 40 to 60 red cells per field with no casts. The non-protein nitrogen was 88. March 21 the patient was still confused, did not recognize people, but carried out simple requests and was sensitive to pain. There was much dry mucus in the throat. A lumbar puncture showed normal pressure and clear fluid with little rise on right jugular compression. There were 10 cells, 4 of them polynuclears. The neck was slightly stiff. There was bilateral Kernig. The fundi were negative. The leukocyte count was 14,400. March 22 the patient died.

Clinical Discussion

RICHARD C. CABOT, M.D., AND
GEORGE W. HOLMES, M.D.

Notes on the History

Dr. Cabot: Relief not only of fatigue but also of nasal obstruction by the substitution of Seidlitz powders for candy certainly is an interesting result!

Up to seven weeks before admission the history does not point to disease of any single organ or to any obvious diagnosis. If one had to begin treatment on the basis of that history alone one certainly would not know what to do.

She was treated at first for iritis and now on examination at the other hospital the eyes show marked conjunctivitis. We should like to know which it is. If she has had an iritis you would think some sign of it ought to show.

The ulcers on the legs and around the anus make us think of syphilis of course.

The smear from the mouth is of no importance.

Why did they do a lumbar puncture? We do not do spinal fluids as a routine. I suppose they wanted further evidence as to cerebrospinal syphilis and thought they had a right to go for it in the spinal cord.

They felt that the fever could be explained by the stomatitis. The question is, what explains the stomatitis? They thought the cause was in the teeth. I do not agree, even though the temperature became normal after the teeth were extracted. It was "post hoc ergo propter hoc".

That neurological examination does not give enough for a basis for the diagnosis of any lesion I know in the spinal cord.

A trophic ulcer in the perineal region means, I take it, an ulcer thought to be due to a cord lesion. I do not know what else it means if it does not mean that.

The loss of fifty pounds in nine months is the important thing to me. Stomatitis does not do that. Pulling out teeth is not going to do that.

The past history does not help us at all. We have to start with the present illness to find out what is the matter.

They do not use that word "emaciated" unless the condition is extreme.

Shotty glands mean nothing. A walnut sized gland ought to mean something—that is, if it is a real walnut.

What were they thinking of when they noted that the tongue was not atrophic?

A Student: Pernicious anemia.

Dr. Cabot: And what else? Syphilis. Pernicious anemia and syphilis are the two things that most often give an atrophic tongue.

There were "inconstant" râles. Take off the letters "in" and that would be more important than anything so far. Inconstant râles do not mean anything.

Those purpuric spots where the ulcers had been certainly make it seem now as though all the ulcers might be due to purpura breaking down.

They did a complete neurological examination certainly. You see they are hunting for a spinal cord lesion.

I do not see how those retinal hemorrhages can be important to the diagnosis in this case. She had had a high blood pressure, and they doubtless associated it with that. But she certainly is not suffering from that now.

The smear showed atypical granulocytes, as almost every smear does if you look carefully. If somebody is on the hunt for those he can always find them. This blood examination gives the same indication that the weight does. She is emaciated. She has secondary anemia. There is some important long-standing disease behind those two symptoms. As yet we have not the slightest idea what it is.

That basal metabolic rate of +34 is significant. A metabolic rate of +15 in a person losing weight does not mean much, but what it means at +34 I have no idea. It is too much to be within normal limits of variation. In a person losing weight we do not generally expect myxedema.

The important things in the spinal fluid report are the strongly positive Wassermann and Pandy tests.

The non-protein nitrogen showed a big jump in a week. The creatinin is nearly twice as much as it ought to be.

There is nothing in the stomach examination to help us.

It was a steadily climbing temperature.

I hope the x-ray examination is going to show something; we are having a hard time with this case. But no one can say this patient did not have a thorough examination!

DR. GEORGE W. HOLMES: The x-rays confirm the note in the record. The stomach was certainly normal in appearance and there was a normal pylorus and cap. There was nothing unusual in the appearance of the duodenum and colon. The colon emptied normally. This was apparently taken after evacuation of the colon following an enema. The films do not give much idea about the delay in the ileum that was spoken of. If that is true it would mean something unexplained in the ileum.

This film of the chest is certainly negative. There is nothing in the lungs or in the heart I should say.

This is the shadow described in the skull. It is a little low and large for the pineal gland, and its character is a little different from that of the pineal gland. This character might be due to the film itself. There is nothing on which to make a diagnosis of brain tumor, although occasionally brain tumor shows calcified areas. There is no other evidence to suggest anything.

In the other films of the spine there is a tilting and a peculiar shape of the first lumbar vertebra. I do not see how that has any bearing on the symptoms.

DR. CABOT: It must be a very old affair, mustn't it?

DR. HOLMES: Yes. It is the result of an injury. It is certainly not the characteristic picture of metastasis. It might explain some of the symptoms in her legs. Nothing was said in the history of her ever having had any injury. Usually that would mean quite a severe injury. It does not suggest syphilis or tuberculosis or metastasis. If it is not the result of an old injury I do not know what it is.

DR. CABOT: That lesion in the skull you cannot connect with the symptoms in this case?

DR. HOLMES: No.

DR. CABOT: You cannot tell which side of the skull that area of calcification is on, can you?

DR. HOLMES: I cannot from that film. If we had had stereoscopic films I could.

DR. CABOT: We are looking for something on the right side.

I should say she was very thoroughly studied by x-ray with negative results. Ileal stasis is not in itself a thing on which you can put much stress, is it?

DR. HOLMES: No. I should think if we had no other cause it might be explained by injury to the cord.

DR. CABOT: As I understand it Dr. Holmes is not quite sure that that spinal lesion might not be connected with injury to the cord and so with the symptoms in the legs which she has had. The difficulties about that are (1) that if it is due to injury and not to neoplasm or to tuberculosis it is queer why she did not have symptoms a long time ago, and (2) why was there no history of the injury? I think that probably has no significance in this case.

There is a great deal I do not know about eye examinations, but I cannot imagine what these findings have to do with this case.

"The abdominals could not be elicited." You remember that is one of the signs in multiple sclerosis. If we could possibly turn this into a case of multiple sclerosis it might get us out of our difficulties. But I do not yet see how we can.

DIFFERENTIAL DIAGNOSIS

Most of the case is still entirely obscure to me. At the end she had a series of very definite brain symptoms,—convulsions, stiff neck, Kernig, and a spinal fluid which is just beginning to be abnormal. Ten cells is on the border line; I do not quite like to say it is abnormal. I think she died of something wrong in the brain. How that is to be connected with all that has gone before I do not know. Dr. Holmes, would you like to swear that that is not malignant disease of the brain?

DR. HOLMES: No.

DR. CABOT: Metastatic brain tumor is a very handsome diagnosis, but here we have no idea of a primary focus. I think we can make no better guess, however, than that. She may have had meningitis at the end, but that certainly does not account for most of the picture. She had something before the meningitis. This steadily rising temperature worries me a good deal. We ought to find some cause for that, and the examination has not brought out any.

A STUDENT: Did they have a pelvic examination?

MISS PAINTER: The pelvic examination was negative.

DR. CABOT: Of course we had rather more red cells in the urine than we should expect.

Can she have had a hypernephroma? There were no bone metastases apparently. They were looked for and were not found. I do not remember a case of metastasis from hypernephroma to the brain showing nothing anywhere else. It is always well to think of hypernephroma when apparently metastatic lesions are present without any known primary tumor. We do have long fever from degenerating neoplasms. We had one high non-protein nitrogen. We had two rather high metabolism tests. But neither of those things helps me at all as to matching up with the other symptoms.

I think I shall have to give it up. I do not believe I can make even a rational guess as to what the diagnosis is except something in the brain at the end, malignant disease or inflammation.

Could the whole thing have been tuberculosis and a tuberculous meningitis? Dr. Holmes says it is not tuberculosis in the spinal cord. We have no other suggestion as to where it could have started. In the abdomen? Did it have something to do with the ileal stasis? That is conceivable. It would account for the emaciation and the secondary anemia. It is ruled out from the lungs by the x-ray and the physical findings.

A STUDENT: The spinal fluid rules out meningitis.

DR. CABOT: Yes. I take back what I said about tuberculous meningitis. You are right, that is impossible.

A STUDENT: The low white cell count and high temperature—what does that suggest?

DR. CABOT: That suggests typhoid fever. There were no Widal tests.

A STUDENT: She had blood in the stools at one time.

DR. HOLMES: It is too bad they did not take that gland out for biopsy. It is hard to make a diagnosis of Hodgkin's disease without a biopsy.

DR. CABOT: Perhaps she had Hodgkin's disease or lymphoma with metastasis to the brain in the end. With a gland as big as that we might have lymphoma that can perfectly well have metastasized to the brain and the intestines.

So in the end I come down not to a diagnosis, but to my feeling, my sentiment, not worthy of the name of diagnosis, that this woman died of malignant disease, and I have a feeling that she had metastasis to the brain at the end. I do not believe she had syphilis or tuberculosis. I do not know what else she could have had. Against malignant disease of course is this long fever. But that is not inconsistent with a sizable neoplasm. You remember that the urologist never was able to have a pyelogram. That might have shown up the cause of the whole thing.

A STUDENT: That meningitis might have been caused by the lumbar puncture needle.

DR. CABOT: She did not have meningitis by the evidence of the spinal fluids. She had some meningitic symptoms.

So I refuse to make a diagnosis, but I have made some guesses. Are there any other guesses?

A STUDENT: Were the enlarged spleen and the generalized enlargement of the lymph glands significant?

DR. CABOT: They felt the spleen once on deep inspiration, and she had one gland under the arm. I have suggested lymphoma as a possibility, but nothing more than that.

A STUDENT: Would not that account for the fever and the basal metabolic rate? Would it not even account for the changes in the spine?

DR. CABOT: I have never seen such changes in the spine from Hodgkin's disease. I do not believe it could produce the changes that Dr. Holmes has shown us.

DR. HOLMES: In Hodgkin's disease changes in the spine occur, but not of this type. We may be putting too much reliance on the x-ray.

DR. CABOT: We are resting everything, as we always do, on Dr. Holmes' interpretation.

That is a good point, I think, that suggestion of the possibility of lymphoma.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Hypernephroma?

DR. RICHARD C. CABOT'S DIAGNOSIS

Possibly malignant disease with metastasis to the brain.

ANATOMIC DIAGNOSES

Bilateral pyelonephritis.
Cystitis.
Hyperplasia of the spleen.

PATHOLOGIC DISCUSSION

DR. TRACY B. MALLORY: I think that, as often in a case of this sort, I am going to be of very little help.

I did not get a chance to look at the brain. In the body, however, we found one very definite lesion, a bilateral, extremely severe pyelonephritis, but nothing else. Perhaps if the urologist had been able to do his cystoscopy the diagnosis might have been cleared up. The spleen was enlarged, but no evidence of Hodgkin's could be made out in it. There was only a mild degree of cystitis and pyelitis, but I have seldom seen a case in which involvement of the whole renal parenchyma in an infectious process was so diffuse. The kidneys were nearly doubled in size and showed infiltration of all the interstitial tissue with polynuclears and lymphocytes. So that I think in all probability the picture is one of chronic sepsis rather than malignancy, and that the cerebral lesion represents a metastatic focus of infection.

A STUDENT: What was the etiology of the pyelonephritis?

DR. MALLORY: Cultures from the kidney showed staphylococcus aureus and colon bacillus.

DR. CABOT: Was the bladder normal?

DR. MALLORY: The bladder showed a very mild degree of cystitis only. The ureters were not dilated.

DR. CABOT: There was no good reason to go into the cord, I suppose?

DR. MALLORY: I did not. It would have been a good idea if we had known about that spinal lesion.

DR. CABOT: That spine did not have anything to do with the kidneys, did it?

DR. MALLORY: No.

DR. CABOT: Suppose they had made this diagnosis and operated on both sides, could they have saved her life?

DR. MALLORY: I do not believe so. The process was too diffuse to make drainage possible, and I do not see what they could have accomplished.

DR. CABOT: That is a very disturbing sort of case. It is certainly tragic that the one examination they did not get a chance to do might have shown what was wrong. It might not have helped the woman, but it certainly would have been a satisfaction to us.

CASE 17212

PAROXYSMAL NOCTURNAL DYSPNEA, CORRIGAN PULSE, NOCTURIA AND IRRATIONALITY

MEDICAL DEPARTMENT

PRESENTATION OF CASE

DR. SVEN M. GUNDERSEN*: This was a sixty-six year old married salesman who came into the hospital on March 17 in a rather delirious condition. His history was obtained from his wife. As he had been married to her only twenty years, the past history is probably unreliable.

He had passed an insurance examination nine years before admission and was perfectly well so far as she knew until three years before admission, when he started having symptoms of diabetes,—increased thirst and appetite, frequency of urination, some loss of weight and strength. His physician found sugar in his urine and put him on a diet, but gave him no insulin. He lost thirty pounds in three months under treatment and felt much improved. He returned to work and gradually returned to his normal diet when his physician died.

Ten months before admission he started to have dyspnea on exertion and also easy fatigue. These symptoms lasted until six months before admission, when he went to a doctor and was found to have an enlarged heart and also arteriosclerosis. He was given digitalis. From that time until admission the patient did not work. His activities were greatly diminished. He had to stay at home all the time and could get about the house only a little. Three months before admission he developed cough productive of a small amount of whitish sputum. At the same time he began having attacks of typical paroxysmal nocturnal dyspnea. Just before admission he had been having ten or twelve of these attacks at night. Three weeks before admission he suffered a return of the nocturia which he had three years before and became entirely disoriented and euphoric. At that time he began to have edema of the ankles and loss of appetite. His physician gave him more digitalis, some colorless medicine which he called "nerve medicine", and some pills.

His first wife died of tuberculosis. Of her four pregnancies one child was stillborn, one died of tuberculosis and one was in an institution for the feeble-minded.

Clinical examination revealed a man obviously in a euphoric and irrational state. He was cyanotic, emaciated and quite dyspneic, sitting propped up in bed. The pupils were irregular and unequal and reacted poorly to light, better to accommodation. The heart was greatly enlarged to the left and downward. At the base were to-and-fro soft systolic and diastolic murmurs. The blood pressure was 165/0 to 185/0. There was marked arteriosclerosis. There was Corrigan pulse. The brachials were tortuous and sclerotic. There were signs of fluid at the right base posteriorly. There was a pistol shot in the groins. The right ankle jerk could not be obtained.

The white blood cell count was 15,000, with an essentially normal differential count. There was no anemia. The one urine specimen obtained showed no sugar.

The patient became rapidly worse in spite of digalen given intramuscularly, and died forty-eight hours after admission.

CLINICAL DIAGNOSES (FROM HOSPITAL RECORD)

Arteriosclerotic and luetic heart disease with aortic regurgitation.
Relative mitral insufficiency.
Congestive failure.
Central nervous system lues?
Diabetes mellitus.

ANATOMIC DIAGNOSES

Arteriosclerosis.
Syphilitic aortitis with aortic regurgitation.
Vascular nephritis.
Accessory lobes of the liver (gummata?).
Hyalin degeneration of the arterioles of the pancreas.
Cholesterosis of the gall bladder.

PATHOLOGIC DISCUSSION

DR. TRACY B. MALLORY: The autopsy on this man was unusual, showing the most extreme degree of arteriosclerosis that I think I have ever seen. I have his heart and kidneys here. I think even at this distance you can see the extraordinary degree of atheroma. The process is most marked in the ascending and abdominal portions. There is an extreme degree of vascular nephritis. We found evidence of arteriosclerosis everywhere.

Throughout almost the entire aorta there were raised areas varying from a few millimeters to a centimeter or more in diameter which were sometimes yellowish, more often pinkish in color,

*Recently senior interne on the East Medical service.

extending up a considerable distance, two or three or sometimes four millimeters from the surface. Those masses looked almost like the vegetations seen on the heart valves in bacterial endocarditis except that they were not quite so red. They did not seem to contain much fibrin. In between these areas the intima was thick, white and fibrous, here and there showing definite pitted scars quite suggestive of lues. Two of the cusps of the aortic valve were rather definitely separated and I feel quite certain represent a luetic lesion. Many cases of luetic aortitis show an associated very marked atheroma. In the face of atheroma, when it is marked, one fairly regularly gets shallow ulcers, and in those ulcers little thrombi of platelets and fibrin commonly form. It is most unusual, however, to find such extensive thrombosis.

This section represents one of those projecting thrombi. Every one of those slits represents a crystal of either cholesterin or some fatty acid. The major portion of the mass consists of lipoid crystals which are imbedded in a rather delicate hyalin matrix probably made up of fused platelets. It seems to contain very little fibrin. The media is very much narrowed, while the adventitia is much thicker and denser than usual and contains many perivascular clusters of lymphocytes. Such a picture is ordinarily taken as characteristic of lues. In some places the media shows vascularization, which is again suggestive of lues but not positive evidence.

The lung is quite interesting in that it too shows a very unusual degree of arteriosclerosis. This vessel for example is almost completely occluded. Only one-tenth of its lumen is patent. Here is another artery with well marked intimal thickening, though still fairly patent, while in the center of the field is a completely occluded artery.

The kidneys are typical of vascular nephritis. The cortex is narrowed. The larger vessels show thickened walls. The small vessels are hyalinized. Some of the glomeruli are completely sclerotic, and there are beginning areas of tubular atrophy about them.

The liver was quite interesting. It showed some very deep depressions which divided the liver into several small accessory lobes. The question came up as to whether it was a congenital abnormality or whether they were scars of healed gummata. It is very suggestive of a syphilitic lesion, although not entirely characteristic. In one section of the liver was a small area of necrosis. With the higher power you can make out the giant cells and a few lymphocytes. It may be either a miliary tubercle, the only one found in any of our sections, or it may be a miliary syphilide. The remainder of the liver shows only very marked passive congestion.

His pancreas shows a very definite hyalin degeneration of the arterioles which goes with the history of diabetes.

It is interesting in view of the extraordinary atheromatous deposits in the aorta that he had very marked cholesterosis of the gall bladder. That is an association which one would expect but as a matter of fact one only rarely finds. It would have been interesting if we could have got his blood fats.

DR. CHESTER M. JONES: Were there any stones or gravel?

DR. MALLORY: No.

A PHYSICIAN: Was syphilis the cause of his arteriosclerosis?

DR. MALLORY: I think the process is almost certainly a combined one of syphilis and atheromatosis. They very frequently are combined. In some of the cases of chronic syphilis one gets the most marked atheromatous lesions. I think that is probably the situation here, but I do not believe we are justified in assuming an etiologic relationship.

DR. GUNDERSEN: There was strongly positive serology.

DR. MALLORY: Yes, and of course the family history fits too.

DR. GEORGE W. HOLMES: Did he have any x-rays?

DR. GUNDERSEN: No.

A PHYSICIAN: Do you think there is any causal relation between atheromatosis and syphilis?

DR. MALLORY: I do not believe so.

DR. WALTER BAUER: Do you think this whole picture could have been caused by arteriosclerosis alone?

DR. MALLORY: No, I do not. The intimal changes in that aorta I think are purely atheroma. The changes in the aortic valve I am sure must have been syphilis; I do not see how atheroma could have done that. I am a little surprised that he showed as much clinical evidence of aortic regurgitation as he did. They could not measure his diastolic pressure. I think there is a large element of functional dilatation of the ring without a doubt.

The New England
Journal of Medicine

SUCCESSOR TO
THE BOSTON MEDICAL AND SURGICAL JOURNAL

Established in 1828

Published by THE MASSACHUSETTS MEDICAL SOCIETY under the jurisdiction of the

COMMITTEE ON PUBLICATIONS

HOMER GAGE, M.D. JOHN W. BARTOL, M.D.
ROGER I. LEE, M.D. ROBERT B. OSGOOD, M.D.
EDWARD W. TAYLOR, M.D.

EDITORIAL STAFF

DAVID L. EDSALL, M.D. STEPHEN RUSHMORE, M.D.
REID HUNT, M.D. HANS ZINSSER, M.D.
JOHN P. SUTHERLAND, M.D. BENJAMIN WHITE, PH.D.
GEORGE R. MINOT, M.D. HENRY R. VIETS, M.D.
FRANK H. LAHEY, M.D. ROBERT N. NYE, M.D.
SHIELDS WARREN, M.D. ROBERT M. GREEN, M.D.

WALTER P. BOWERS, M.D., *Managing Editor*

ASSOCIATE EDITORS

GEORGE G. SMITH, M.D. WILLIAM B. BREED, M.D.
JOSEPH GARLAND, M.D.

THE NEW HAMPSHIRE MEDICAL SOCIETY
PUBLICATION COMMITTEE

D. E. SULLIVAN, M.D. H. H. AMSDEN, M.D.
R. H. MARCOTTE, M.D.

THE VERMONT STATE MEDICAL SOCIETY
PUBLICATION COMMITTEE

WILLIAM G. RICKER, M.D. C. F. DALTON, M.D.
J. A. WARK, M.D.

SUBSCRIPTION TERMS: *$6.00 per year in advance, postage paid for the United States, Canada $7.04 per year, $7.56 per year for all foreign countries belonging to the Postal Union.*

Material for early publication should be received not later than noon on Saturday. Orders for reprints must be sent to the Journal office, 165 Newbury Street.

The Journal does not hold itself responsible for statements made by any contributor.

Communications should be addressed to The New England Journal of Medicine, 165 Newbury Street, Boston, Mass.

THALLIUM, A DANGEROUS DRUG

THALLIUM, in the form of the acetate, is principally used as a depilatory in the treatment of ringworm of the scalp. Discovered as an element by Crookes in 1861, the drug was popularized by Sabouraud about thirty years ago; then abandoned as too toxic and dangerous until revived about 1918, in Mexico, by Cicero and later in Europe, largely by Buschke. The dose is usually limited to 8 mg. per kg. of body weight and, since children show a greater tolerance than adults, thallium is generally used to depilate children under seven or eight years of age.

In addition, however, the drug occurs in face creams, sold in the open market, for the removal of superfluous hair. A patient, recently admitted to a Boston hospital, suffering from severe peripheral neuritis, was poisoned by thallium used in this manner.

Many fatal cases, moreover, have been reported in the literature. Lynch and Scovell* give the details of the death of three children, aged 10, 7 and 5 years, poisoned by thallium acetate administered as a depilatory in ringworm. The dose in each case, however, was too strong, according to the usual standards, due to an error in dispensing. In another group of children, noted by Lynch and Scovell, 13 out of 16 died. Some patients who have not even received a depilating dose have failed to recover from the toxic effects.

As the drug, like lead, has a special affinity for the nervous system, non-fatal cases usually show peripheral neuritis, largely motor in type, with atrophy; or evidence of structural damage to the brain, with mental affection or a striatal syndrome. Recovery is slow, but tends to be complete, specially the neuritic forms.

Apparently the margin between a depilating and a toxic dose is extremely small and allows for no idiosyncrasies. The public should be warned against its use for the removal of superfluous hair and physicians should either use the drug with great caution or, as many writers suggest, abandon it altogether. Other less dangerous, though slower, means of depilation are available: for example, the roentgen ray. Although it, too, has dangers, specially in inexperienced hands, the damage done by an overdose is local and not fatal.

*Lynch, G. R. and Scovell, J. M. S. The toxicology of thallium. Lancet 2:1340, (Dec. 20) 1930.

HAPPINESS — THE PANACEA OF DELINQUENCY

HAVING become convinced that the average general practitioner needs prodding to bring about more direct consideration of the problems of juvenile delinquency we venture to refer again to this important responsibility now facing society.

It is obvious that those brought into primary contact with unsocial family conditions should exercise guidance in reforms, or pass the responsibility on to the specialist.

The psychiatrists are the generals in the army but the family doctor is on the front line. He sees the misfits in life at short range. If there is bodily disease he treats it with fidelity but too often he regards his duty done when the patient has recovered from the acute physical disturbances although he may have observed incompetence on the part of the parents and a child drifting into a morbid mental state. His opportunity for a service to the family and the State is not often recognized in the presence of juvenile delinquency. If he suspects tuberculosis in the family his fears are reported to the proper officials and the case is studied and cared for. On the other hand if there is evidence of irremediable discord in the group the doctor rarely takes it upon himself to use his best endeavors to promote harmony and often fails to consult the state authorities with the

object of preventing disasters which may be worse than death due to tuberculosis.

Our leaders in the field of psychoneurosis are too often like the specialist in abdominal surgery who is consulted too late. They frequently find the stage set for chronic custodial control with little opportunity for therapeutic measures.

Even if we are really concerned about the dangerous tendencies of early delinquencies and unite in the determination of scientific treatment the question is, are we prepared to grapple with corrective and defensive resources?

Perhaps there is something to be learned from the Illinois Institute for Juvenile Reform which originated as an adjunct of the Chicago Juvenile Court. This organization began with the examination of delinquent children for indications of feeble-mindedness but after working out plans and methods for dealing with wayward children it was taken over by the State of Illinois as part of its welfare plan to carry on a phase of the State Criminologist's work.

At present an able staff of psychiatrists and physicians are working under Dr. Paul L. Schroeder, State Criminologist.

The fundamental appeal for care is the question whether the child is unhappy. Fannie M. Worthington sums up the theory on which the work has been developed as follows:

"No child is born so bad but that he may be reared into happiness and goodness by intelligent, tender guidance.

"But what if from infancy he has known only neglect and ignorance, want and wickedness? What chance in life has that poor baby? He is the tiny, unprotected victim of degraded surroundings and influence, the blameless slave of wretchedness and vice. He grows up to be a copy of his parents and associates, however evil. When misery makes him rebel against his conditions he turns to misdemeanors and later to crimes.

"Now psychologists, under the guidance and control of the State, strive to save him to a happy and useful life."

Does this not indicate a humanitarian spirit as well as a protective plan for society?

THIS WEEK'S ISSUE

Contains articles by the following named authors:

Kuhns, John G. A.B., M.D. Johns Hopkins University 1924. Assistant in Orthopaedic Surgery, Harvard Medical School. Assistant Orthopaedic Surgeon to Outpatients, Children's Hospital, Boston, and Robert Breck Brigham Hospital. Consulting Orthopaedic Surgeon, Sturdy Memorial Hospital, Attleboro. His subject is: "Funnel Chest Deformity." Page 1077. Address: 372 Marlborough St., Boston.

Pyle, Edwin. M.D. Columbia University College of Physicians and Surgeons 1915. Formerly, Associate Attending Surgeon, St. Luke's Hospital in charge of Orthopedic Service. Assistant Surgeon, New York Orthopedic Hospital. Attending Orthopedic Surgeon, Sea View Hospital. Now attending Orthopedic Surgeon, Waterbury Hospital. His subject is: "Congenital Abnormalities of the Lumbo-sacral Region as Causes of Persistent Low Back Pain." Page 1083. Address 95 North Main St., Waterbury, Conn.

Hawes, John B. 2nd. A.B., M.D. Harvard University Medical School 1903. President, Boston Tuberculosis Association. Director, Massachusetts Tuberculosis League and National Tuberculosis Association. President, Cosmopolitan Medical Club. His subject is: "Hemorrhage in Pulmonary Tuberculosis." Page 1088. Address: 11 Marlborough St., Boston.

McClure, Charles W. M.D. Ohio State University College of Medicine, Columbus 1910. Member Senior Staff Evans Memorial. Chief of Gastrointestinal Division of Department of Biochemical Research, Evans Memorial. Gastroenterologist to the Out-Patient Department, Massachusetts Memorial Hospitals. Visiting Physician to the Massachusetts Memorial Hospitals. Address: 416 Marlborough Street, Boston. Associated with him are:

Bloomberg, Esther L. B.S. Technical chemist to the Department of Biochemical Research, Evans Memorial. Address: 1409 Commonwealth Avenue, Brighton. And

Huntsinger, Mildred E. M.A. Chemist to the Department of Biochemical Research, Evans Memorial. Address: 110 Highland Avenue, Arlington. Their subject is: "Studies in Fat Metabolism, IV. New Procedures for Quantitating the Organic Phosphorus in Small Amounts of Bile." Page 1091.

Finkel, Henry S. M.D. Harvard University Medical School 1920. Gynecologist to Out-Patient Department, Beth Israel Hospital. Visiting Obstetrician, Evangeline Booth Hospital. Instructor in Obstetrics, Tufts College Medical School. His subject is: "Physiology of the Ovarian Hormones." Page 1094. Address: 21 Bay State Road, Boston.

Pollack, Herbert. M.D. Cornell University Medical College 1929. Interne in Pathology, Palmer Memorial Hospital. His subject is: "A Case of Purpura with Unusual Necropsy Findings." Page 1098. Address: 195 Pilgrim Road, Boston.

Prenn, Joseph. M.D. Tufts College Medical School 1908. His subject is: "Ethyl-Iodide in Ear, Nose and Throat." Page 1099. Address: 491 Commonwealth Avenue, Boston.

Stater, Wayne J. A.B., M.D. Harvard University Medical School 1921. F.A.C.S. Member of Attending Staff of the Good Samaritan Hos-

pital and Associate Staff of the Emanuel Hospital (both of Portland, Oregon). His subject is: "Transplantation of the Gall Bladder." Page 1101. Address: Medical-Dental Bldg., Portland, Oregon.

MASSACHUSETTS LEGISLATIVE NOTE

THE HEARING ON THE CHIROPRACTIC BILL

The hearing on the chiropractic bill before the Ways and Means Committee was conducted May 14.

The proponents were not well organized, for the lawyer acting as counsel for the chiropractors frankly acknowledged that he did not wholly approve of the bill, but in answer to questions did not produce the bill which would be endorsed by him. Certain chiropractors testified according to the usual custom of claiming results not obtainable by the regular profession. One in answer to a question by a member of the Committee frankly acknowledged practicing contrary to law, but justified his work by the assertion that there were differences of opinion as to what is and what is not illegal.

The opposition to the bill by the Committee on Legislation, the Commissioner of Health, the Commissioner of Mental Diseases and a few others was dignified and appeared to be convincing to the few members of the Committee present at the hearing.

On Wednesday May 20, the Committee on Ways and Means reported to the House a substitute bill, House 1514, with the recommendation that it be rejected. This recommendation was adopted without debate and therefore the attempt of chiropractors to secure registration in Massachusetts is defeated. Massachusetts thus stands committed to a single standard for the regulation of the practice of medicine.

We congratulate the legislature of this Commonwealth.

MISCELLANY

A BROADCASTING MESSAGE BY THE STATE DEPARTMENT OF PUBLIC HEALTH

Use and Abuse of Cancer Resources*

DR. CHANNING C. SIMMONS

In 1926 the Legislature passed "An Act to promote the prevention and cure of cancer, and the extension of resources for its care and treatment." This Act directed the Department of Public Health to do three things:

1. To open a cancer hospital
2. To establish and organize cancer clinics in such parts of the Commonwealth as may be most advantageous to the public health
3. To make further studies as to hospital resources in the State and to formulate plans for extending the same, etc.

In accordance with this vote the Department of Public Health inspected several sites and finally acquired the hospital in Wrentham originally built for the care of alcoholic and narcotic addicts. This is now known as the State Hospital at Pondville. It was at once recognized that the institution to be of value to the community should not be an almshouse for the care of hopeless terminal cases, but should be in a position to give adequate treatment to patients suffering from early as well as late cancer. The Staff was appointed, therefore, with the idea that it should act in an advisory or consulting capacity with physicians throughout the State. The value of such an institution has been proved by the fact that it has been necessary to enlarge it to its present capacity of 120 beds, and that there is now a waiting list of patients desirous of admission. That this is not a home for incurable is shown by the fact that out of 656 patients admitted, in 1929, 288 were discharged relieved or improved. The Consultation Clinic has also grown.

It is impossible for patients from certain parts of the State to attend the clinic at Pondville, and Consultation Cancer Clinics were, therefore, established at various centers. These clinics are sponsored and aided by the Department of Public Health, but are organized only with the approval and coöperation of the District Medical Society which selected the Staff from the physicians in the community who are particularly interested in this branch of medicine. At the present time there are Consultation Clinics in 13 cities of the State, namely, at Pittsfield, North Adams, Brockton, Greenfield, Lawrence, Lowell, Lynn, New Bedford, Newton, Worcester, Fitchburg, Leominster and Gardner, as well as five in Boston which are recognized by although not under the control of the Department. Two thousand one hundred and six patients were seen in consultation at these clinics in the year 1929. Of these, 681 were found to have cancer or to require treatment for precancerous conditions.

It is generally recognized that no one man can be expected to give the best advice on all forms of cancer and, therefore, all the so-called specialties are represented at these clinics; that is, there are men on the Staff who have had special training in the use of radium and x-ray in skin diseases, in diseases of the eye, ear, nose and throat, genito-urinary diseases, and diseases of women, as well as surgeons and physicians trained with special reference to cancer and the allied diseases of the blood.

The Consultation Clinics are held in the smaller communities every one or two weeks, while in Boston they are held more frequently. The clinics were established primarily for the benefit of the public, but they cannot care for all cases of cancer or suspected cancer in the community and have been formed with the idea that the Staff should act, without remuneration, in the capacity of Consultants with the practicing physician.

In certain cases of cancer, particularly those in which the disease is advanced the diagnosis is plain, but there are many instances in which the true condition is obscure and the diagnosis difficult. This is particularly true in the early course of the disease, and it is in this stage that cancer is curable. It

*Broadcast April 1, 1931.

is not generally appreciated that cancer in its inception and for some time thereafter causes no subjective symptoms, that is the patient is conscious of no pain or inconvenience. There are usually objective symptoms which although of little moment to the patient would lead a physician at least to suspect the real nature of the trouble. It is to give consultation service in this type of case that cancer clinics have been established. It is not claimed that every case of cancer can be recognized early and cured, but in at least 60% of the cases there are signs which should lead an individual to consult his physician when the disease is in its incipient stage. It is a fact that a few years ago the average duration of a case of cancer of the breast, before proper treatment was instituted, was one year. At the present time this delay has been reduced to six months, a distinct improvement but the delay is still much too long.

The term "Cancer" is applied to a tumor having certain characteristics, but the malignancy and the rapidity of growth varies greatly in the different organs. Under the microscope, cancer is composed of a certain type of cell which has a tendency to migrate through the body. Where the cells eventually lodge they multiply and a second cancer develops. Our present conception of the disease is that in the beginning cancer originates at some point and is at first local. If it can be destroyed at this stage a cure can be effected, and it is for this reason that you are urged to consult your physician at the first sign of trouble and to submit to appropriate treatment before the disease has become disseminated. Cancer in certain situations is of very slow growth and may not spread through the body for a long time. Thus cancer of the skin, particularly of the face may be present for years before it obtains any considerable size. Cancer of the tongue on the other hand grows rapidly, involves neighboring structures early and is often hopeless as regards cure in a few months. Both of these growths are called cancer, although clinically they are entirely different diseases, and forms of treatment that will cure cancer of the skin are quite inadequate to cure cancer of the tongue.

I have said that early cancer causes no pain. The objective symptoms vary with the organs involved. Cancer of the skin is at first a painless, scabbing, hard area which later ulcerates. Cancer of the tongue begins as a small, painless ulcer. Cancer of the breast is a small, painless lump. Multiple small lumps in the breast which cause some discomfort are rarely cancer. The symptoms of cancer of the womb or of the lower bowel are some changes in the natural discharges or habits.

We do not know the cause of cancer. Much work is being done in the laboratory and many theories have been advanced but none has as yet been generally accepted. It may be said that cancer is not a contagious disease and is not due to a microörganism. In man at least it is apparently not hereditary, although a certain susceptibility may be transmitted. This susceptibility is very marked in cancer in mice. Various articles of diet have been brought forward as causing cancer, such as large amounts of meat, fish and raw vegetables, or even large quantities of water, but there is no proof that these have any relation to the disease. We do know that chronic irritation has a distinct relation to cancer. Cancer of the skin is very common in paraffin and taw workers, as well as those exposed to small doses of x-ray over a long period of time. Rough teeth, poorly-fitting dental appliances and the use of tobacco have a distinct casual relation to cancer of the mouth. This does not mean that every one who smokes or wears false teeth will necessarily have cancer, as the mucous membrane of the mouth is susceptible to the irritation in only certain individuals. There are certain simple growths such as a rare type of pigmented mole that is prone to undergo malignant changes and if this is removed or destroyed early the danger is eliminated.

The message the Massachusetts Medical Society wishes to convey to you is that if you have any disease that may be cancer or if you fear cancer consult your physician. If you have it he should tell you. If he is in doubt, the Department of Public Health has supplied facilities in the way of Cancer Clinics to which your physician can refer you for consultation without charge to you. You will be examined at these clinics and your physician sent a letter giving the opinion of the consultants as to your condition and suggestions, if any, as to the best method of treatment.

We appreciate the fact that certain individuals with a simple disease may pass a few sleepless nights fearing they have cancer. Their fears may be set at rest, however, by consulting a physician and it is better that this should occur than that so many should die of cancer through ignorance, believing erroneously that the small tumor of the tongue or breast cannot be malignant if it does not pain.

MORTALITY RATES

Telegraphic returns from 81 cities with a total population of thirty-six million for the week ending May 2 indicate a mortality rate of 12.0 as against a rate of 12.8 for the corresponding week of last year. The highest rate (19.5) appears for San Antonio, Texas, and the lowest (6.2) for Lowell, Mass. The highest infant mortality rate (18.1) appears for Waterbury, Conn., and the lowest for Bridgeport, Conn., Cambridge, Mass., Lynn, Mass., Portland, Oreg., San Diego, Calif., South Bend, Ind., Utica, N. Y., and Youngstown, Ohio, which reported no infant mortality.

The annual rate for 81 cities is 13.7 for the eighteen weeks of 1931, as against a rate of 13.3 for the corresponding weeks of 1930.—*Department of Commerce.*

CORRESPONDENCE

THE COMMITTEE ON THE COSTS OF MEDICAL CARE

310 Cedar Street, New Haven, Conn.,
May 6, 1931.

Editor, *New England Journal of Medicine:*

I came across the enclosed in the *Annals of Medical History*, Vol. I, page 53. It seems to me highly pertinent with regard to one of the basic psychological problems with which our committee has to deal.

Yours very sincerely,
C.-E. A. WINSLOW.

THE THREE CHARACTERS OF A PHYSICIAN

Enricus Cordus

1486-1535

Tres n.. ·us habet facies, unam, quando rogatur
Angelicam; mox est, cum juvat, ipse Deus.
Post ubi curato, poscit sua praemia, morbo.
Horridus apparet, terribilisque sathan.

Three faces wears the doctor: when first sought
An angel's!—and a god's, the cure] if wrought:
But when, that cure complete, he seeks his fee,
The Devil then looks less terrible than he.

PROBLEMS INCIDENT TO DEALING WITH VENEREAL DISEASES

The Commonwealth of Massachusetts
Dep.·tment of Public Health
State House, Boston

May 5, 1931.

Editor, *New England Journal of Medicine:*

If this communication had been submitted as an article it might well have borne the heading "Doctor or Druggist?"

A few days ago we saw a case of secondary syphilis in a colored woman about 25 years of age. This woman's mouth was so covered with mucous patches and condylomata that it was hardly possible to find an area of healthy mucous membrane. Needless to say every one of these lesions contained innumerable spirochetes as was readily determined by darkfield examination. The woman's body, furthermore, was covered with lesions typical of this stage of the disease, as were also her genitalia. Clinically there was not the slightest doubt about the diagnosis and clinical diagnosis was readily confirmed by both darkfield and serological study.

Upon inquiry it was learned that for three weeks this patient had been treated by a Boston druggist for "blood disease" for which some unknown oral medication and a salve had been prescribed. She is married and has a daughter three or four years of age. It is highly probable that both her husband and daughter have been infected. The highly dangerous oral lesions may also have very readily been responsible for infections in other persons with whom this woman may have come into intimate contact, even of a non-sexual nature.

Our first reaction was one of outrage that an obvious case of syphilis should have been so long treated both to the disadvantage of the patient and of those with whom she came in contact, by an individual who neither had the right nor the knowledge required of those who may treat this disease.

The next afternoon, however, we saw a very similar case of secondary syphilis in a white woman about 35 years of age, whose body lesions were even more extensive than those in the case of the colored woman. Further, this patient's throat was so filled with typical syphilitic condylomata that it was impossible to see beyond the uvula. A persisting primary lesion also was found in the mouth. The patient was feeble-minded, had a six or seven year old feeble-minded daughter and was living with a taxicab driver, her husband having been dead for two years.

Imagine our consternation when upon inquiry (since confirmed through the physician) we learned that this woman had on three occasions over a period of six weeks visited a physician for her condition and for treatment had received a prescription for "white-wash". No blood test had been taken nor even suggested to the patient. The physician is a graduate of a Class A medical school and has practiced medicine for many years in the Metropolitan area.

This Department has for the past two years attempted to secure the coöperation of the 2000 druggists in the State to that extent at least that persons seeking information concerning, or treatment for gonorrhea or syphilis will be directed to a physician's office for such information or treatment. It is assumed that since a physician is licensed to practice medicine, he should be better qualified than the druggist to treat.

If the type of treatment given in some physicians' offices, and of which the above is an example, was of frequent occurrence, there would be cause for exasperation. Our experience has been, however, that both gonorrhea and syphilis, even in their most obvious forms and stages, are frequently enough missed or mistreated to make us wonder whether or not we may in some instances be wasting our time in exhorting druggists to send their "patients" to a doctor.

Yours truly,
N. A. NELSON, M.D., *Epidemiologist,*
In Charge of Venereal Disease Control.

AN APPEAL TO THE FAMILY PHYSICIAN

The School Committee of the City of Boston

To the Editor, *New England Journal of Medicine:*

The Department of School Hygiene is planning to interest parents whose children are eligible for admission to the kindergarten and first grade classes of the public schools in its program of securing for this pre-school age group the correction of remediable physical defects before the children become part of the school population.

Based on a population of 110,000,000 in the United States, it is estimated that 11,000,000 children belong

to the pre-school age group, nearly one-half of the estimated population of children of school age.

The interest of the parents of these pre-school children should be aroused to appreciate the value of proper health supervision for this age group by giving the subject the proper publicity, preferably through the medium of the family doctor and aided through coöperation by local, State, and National health agencies. Through the influence of these factors, it would not be long before children of this age group would come to the schools, when eligible for admission, free from remediable physical defects and be fully prepared to undertake the educational work required of them. This step in child health conservation has been advocated by health agencies throughout the land, and it is regrettable that the individual physician has been slow to recognize its full value and become a positive factor in its practical application.

The time has arrived when the family physician must recognize his opportunities in this field of activity by employing some of his time and energy in educating the families with which he has professional contact in the health value of preparedness of the pre-school child to meet the more or less arduous class work demanded of the pupil in the modern public school. Such a program of preventive and corrective medicine in a doctor's private practice would not only benefit the pre-school children of today but it will create a healthier and better school population of tomorrow; certainly a better grade of future citizenship will thus be developed.

Through this form of personal interest, he, and not the private and public health agencies, would be expected, within certain limitations, to carry on the preventive and curative program which must necessarily be a part of all community life. The family doctor has in this field of activity unlimited opportunities for constructive medical and social work distinctly apart and independent of the prerogatives of our health agencies whose field of interests are well defined but who are compelled to invade neglected territory as a matter of public necessity and to continue to function there until the family doctor recognizes and is willing to assume these responsibilities.

With the opening of the Boston public schools in the fall of this year, every entering child should be prepared to do the work of the grade without the needless interruption and the disturbing interference occasioned by enforced absence from school because of uncorrected physical defects which should have been attended to before the child was enrolled as a pupil. Doctors are, therefore, requested to inform their clientele by letter or by personal interview with parents that before a child is enrolled in a school he should be given a physical examination for the purpose of ascertaining his physical fitness and for the correction of remediable defects, if any are discovered, in order that he may continue without handicap or interruption to accomplish the school work required of him.

The doctor should examine for such defects as hypertrophied tonsils, defective nasal breathing, carious teeth, defective eyesight and hearing, malnutrition, hernia, correctable orthopedic defects (flat feet, scoliosis, and abnormal posture), skin conditions, especially those that are contagious, anaemia, nervous conditions, and other remediable defects. These conditions should be corrected either by the family physicians or by the specialist, and if the family circumstances warrant such a course, the patient may be referred to the nearest health unit, hospital, or dispensary.

Children suffering from organic heart disease should be kept under observation by the family doctor or referred to the hospital cardiac clinic, and the parents should be instructed how to care for such children.

Protection against diphtheria should be afforded every child by injecting him with toxin-antitoxin and by testing for immunity six months later by the Schick test.

Every child must be vaccinated; the statutes require it.

If the profession created a demand, the local or state health departments would furnish doctors with printed cards which would set forth the necessity for these examinations. These cards could be mailed to families with which they have had professional contact and would go far toward removing from the minds of patients any misinterpretation of his motives.

The Department reiterates a previous confession of principle, recently published in letter form in this *Journal*, that until the family doctor recognizes his opportunities and assumes his responsibilities in the fields of preventive and corrective medicine, it is the unequivocal duty of public agencies to continue this work and to protect the public and individual health, especially of the children of pre-school and school age groups.

Very truly yours,
SOLOMON H. RUBIN, M.D.,
Acting Director of School Hygiene.

NOTICES

DR. LAHEY CORRECTS CERTAIN UNWARRANTED RUMORS

May 12, 1931.

Rumors to the effect that I am ill and no longer operating have reached my ears a great many times. They are so unfounded and so ridiculous that they have never seemed to me to justify recognition.

My friends and associates feel, however, that they have now reached such a dimension that they demand attention.

Never have I been in better health, worked harder, or operated more regularly than now and I hope that my friends and friends of the Clinic will take the opportunity to deny these baseless rumors whenever they arise.

FRANK H. LAHEY.

THE RESTORATION OF THE REGISTRATION OF DR. WILLIAM Y. SILLS

The Board of Registration in Medicine has restored the registration of Dr. William Y. Sills, which was suspended April 10, 1930.

REMOVALS

Dr. J. A. Dubins announces the removal of his office from 103 Columbia Road, Dorchester, to 371 Commonwealth Avenue, Boston.

Dr. Walter C. Howe announces the removal of his office to 89 Marlborough Street, Boston.

Dr. A. C. Eastman announces the removal of his office to 44 Chestnut Street, Springfield, Mass.

Dr. E. J. Teagarden announces the removal of his office to 44 Chestnut Street, Springfield, Mass.

Dr. Clara P. Fitzgerald announces the removal of her office to 137 Pleasant Street, Worcester, Mass.

Dr. Hermon Norton announces the removal of his office to 242 Homer Street, Newton Centre, Massachusetts.

REPORTS AND NOTICES OF MEETINGS

ESSEX SOUTH DISTRICT MEDICAL SOCIETY

The annual meeting of the Essex South District Medical Society was held Tuesday, May 12, 1931, at The Tavern, Gloucester. Dinner at 6:30 P. M.

At the close of the dinner reports for the year by the secretary and treasurer were received and accepted. Election of officers for the ensuing year resulted as follows:

President: Dr. A. E. Parkhurst, Beverly.

Vice-President: Dr. R. E. Foss, Peabody.

Secretary, Dr. R. E. Stone, Beverly.

Treasurer: Dr. Andrew Nichols III, Danvers.

Librarian: Dr. C. M. Cobb, Lynn.

Commissioner of Trials: Dr. J. E. Simpson, Salem.

Censors: Dr. J. F. Jordan (Supervisor), Peabody; Dr. R. W. Haywood, Salem; Dr. A. E. Parkhurst, Beverly; Dr. C. A. Worthen, Lynn; Dr. Hanford Carvel, Gloucester.

Councilors: Dr. J. Armand Bedard, Lynn; Dr. J. F. Jordan, Peabody; Dr. R. E. Foss, Peabody; Dr. N. P. Breed, Lynn; Dr. J. W. Trask, Lynn; Dr. E. B. Hallet, Gloucester; Dr. C. H. Phillips, Beverly; Dr. W. G. Phippen, Salem; Dr. J. F. Donaldson, Salem; Dr. W. T. Hopkins, Lynn; Dr. F. W. Baldwin, Danvers; Dr. O. S. Pettengill, Middleton; Dr. C. L. Curtis, Salem.

Executive Committee: Dr. John Adams, Salem; Dr. R. P. Hallet, Gloucester; Dr. C. L. Hoitt, Lynn; Dr. Sherman Golden, Beverly; Dr. O. S. Pettengill, Middleton; Dr. C. A. Bonner, Hathorne.

Nominating Councilor: Dr. N. P. Breed, Lynn.

Alternate Nominating: Dr. W. T. Hopkins, Lynn.

The following, Dr. A. E. Parkhurst, Dr. R. E. Stone, Dr. P. P. Johnson, by reason of their office are also Councilors.

Brief remarks were made by Benjamin Spector, M.D., and by James F. Ballard, Director of the Boston Medical Library.

A medical pageant was presented by Tufts College Medical School, Department of Medical History, Benjamin Spector, M.D., Associate Professor of Anatomy, Director.

The characters which were represented are as follows: Hippocrates, Moses Maimonides, Andreas Vesalius, Ambroise Paré, William Harvey, Thomas Sydenham, Louis Pasteur, Joseph Lister, Paul Ehrlich.

Each player was costumed and made up to represent faithfully the character which he portrayed and gave a sketch of the life and contribution to medicine of the assumed character.

An exhibition of the classical texts of the characters portrayed in the pageant were described by James F. Ballard, Director of the Boston Medical Library. He also showed a few clay tablets of the Egyptian era about 3500 B. C.

Adjournment was followed by dancing.

WM. T. HOPKINS, *Reporter.*

WORCESTER DISTRICT MEDICAL SOCIETY

OFFICERS ELECTED FOR 1931-1932

President: Dr. Ernest L. Hunt, Worcester.

Vice-President: Dr. Edwin R. Leib, Worcester.

Treasurer: Dr. Roy J. Ward, Worcester.

Secretary: Dr. Erwin C. Miller, Worcester.

Orator: Dr. Walter C. Seelye, Worcester.

Councillor on Nominations: Dr. David Harrower, Worcester. Dr. Royal P. Watkins, Worcester—Alternate.

Committee on Funds: Dr. Michael F. Fallon, Worcester; Dr. Royal P. Watkins, Worcester; Dr. Leslie R. Bragg, Webster.

Commissioner of Trials: Dr. Walter P. Bowers, Clinton.

Councillors: *Dr. Walter P. Bowers, Clinton, term began 1902; *Dr. Samuel B. Woodward, Worcester, 1902; Dr. Leslie R. Bragg, Webster, 1922; Dr. Frank H. Clapp, North Grafton, 1930; Dr. Philip H. Cook, Worcester, 1929; Dr. William J. Delahanty, Worcester, 1913; Dr. George A. Dix, Worcester, 1921; Dr. George E. Emery, Worcester, 1920; Dr. Michael F. Fallon, Worcester, 1916; Dr. Homer Gage, Worcester, 1906; Dr. James J. Goodwin, Clinton, 1921; Dr. Ray W. Greene, Worcester, †1907; Dr. David Harrower, Worcester, 1905; Dr. Arthur W. Marsh, Worcester, 1922; Dr. Walter C. Seelye, Worcester, 1930; Dr. Edward H. Trowbridge, Worcester, 1924; Dr. Royal P. Watkins, Worcester, 1927; Dr. Frank H. Washburn, Holden, 1916; Dr. Albert M. Shattuck,

*Councillor for life by virtue of being past president of the Society.
†Continuous except 1915-1916.

Worcester, 1931; Dr. Joseph W. O'Connor, Worcester, 1931.

Censors: Dr. George A. Dix, Worcester; Dr. Oliver H. Stansfield, Worcester; Dr. Benjamin H. Alton, Worcester; Dr. Ralph S. Perkins, Worcester; Dr. Michael B. Fox, Worcester.

Nominating Committee: Dr. Morton H. Langill, Worcester; Dr. H. V. Williams, Whitinsville; Dr. C. R. Abbott, Clinton; Dr. C. A. Sparrow, Worcester; Dr. John Fallon, Worcester.

Library Committee: Dr. William F. Lynch, Worcester; Dr. William F. Holzer, Worcester; Dr. Oliver H. Stansfield, Worcester.

Librarian: Dr. Albert C. Getchell, Worcester.

Auditing Committee: Dr. Russell T. Draper, Uxbridge; Dr. Percy A. Brooke, Worcester; Dr. George A. Rice, Holden.

BRISTOL COUNTY ORTHOPAEDIC CLUB

The Bristol County Orthopaedic Club were guests of the Orthopaedic and Fracture Services of the Rhode Island Hospital, 593 Eddy Street, Providence, Rhode Island, on May 14, 1931, from 9:00 A. M. to 1:30 P. M. There was an orthopaedic clinic by Drs. Roland Hammond and Herbert E. Harris and a dry clinic by Dr. Robert C. Robinson.

Dr. Murray S. Danforth, Chief of the Fracture Service, showed many interesting types of fractures and their method of treatment. Drs. Roland Hammond, Herbert Harris, Robert Robinson, Albert A. Barrows, Peter P. Chase, Anthony Corvese and F. B. Littlefield are associated with the Fracture Service and they demonstrated various types of fractures under their care. A luncheon was served by the hospital at 1:30 P. M.

EARLE E. HUSSEY.

REPORT OF THE 48th ANNUAL MEETING OF THE AMERICAN CLIMATOLOGICAL AND CLINICAL ASSOCIATION

The American Climatological and Clinical Association held its 48th Annual Meeting at the Homestead at Hot Springs, Virginia, May 7, 8, and 9. Sixty-three men attended the meeting. The Pacific coast, Colorado, New Brunswick, Toronto, as well as New Orleans and the Eastern cities were represented in the group.

The Association in its beginning was made up of the men who became prominent in the crusade against tuberculosis and for many years this Association has furnished presidents of the National Tuberculosis Association. In later years the Association has turned to clinical medicine, being almost the only one of the national societies where true clinical medicine is of chief importance in the minds of the members. There is at the meetings an opportunity for frank discusson of clinical opinion such as may arise among friends. The scientific meetings are held in the mornings of the three days' session and the afternoon affords opportunity for the discussion of the papers on the golf links and in the hotel lobby.

There is a spirit of comradery which is not found in many of the larger medical societies, and the meetings, being usually held at a resort hotel, tend to promote good fellowship.

Scientific papers were read by Dr. Joseph T. Wearn, Dr. William S. McCann, Dr. Thomas A. Claytor, Dr. Thomas M. McMillan, Dr. Samuel Bellet, Dr. W. S. Lemon, and Dr. Russell L. Haden.

Dr. Louis Hamman of Baltimore was elected President for the ensuing year. Dr. Arthur K. Stone, Framingham Center, Massachusetts, was reëlected Secretary and Treasurer.

THE MASSACHUSETTS PSYCHIATRIC SOCIETY

A meeting of the Massachusetts Psychiatric Society was held at the Boston Psychopathic Hospital May 1, 1931. A paper entitled "The Dynamics of Intracranial Pressure Conditions, With Special Reference to the Internal Jugular and Carotid Puncture," by Abraham Myerson, M.D., and Julius Loman, M.D., was presented. An abstract of this paper follows:

The physics of the intracranial cavity is unique.

There is, first of all, a closed, bony box, in which the incompressible brain is situated. There are three fluid streams which, with the meninges, make up the rest of the contents of this box. There is, first, the pulsating, arterial stream with its relatively high pressure. This has two main directions of circuit. It breaks up first into capillaries which lessen in pressure and which are returned by the venous flow, and second, according to present-day theories into the capillaries in the choroid plexus, which are responsible either in one way or another for the formation of the cerebrospinal fluid.

The pulsation of the arteries almost ceases within the brain, and the brain as a whole pulsates in any considerable measure only when the closed box has either not been formed, as in the infant, or when it is artificially destroyed, as by trephine.

The second stream, that of the venous return, is also unique, in that first, there are no valves; second, that the largest part of the return is through sinuses of a peculiar type and so arranged in space that the return venous flow is retarded. These sinuses empty into the jugular vein and the anatomical relationship is such as to further deter the emptying of the sinuses.

Third, there is the cerebrospinal fluid, which is intermediary in point of origin and absorption between the arteries and the veins, has a relatively slow circulation, if any, and which by its pressure and chemical-cytological contents has been the main object of neuro-pathological study on the living.

It has been shown by animal experimentation, carried on by a long line of distinguished workers: first, that the contents of the cranial cavity tend to be constant; second, that posture, respiration, abdominal situations, and general alterations in the vaso-motor-visceral situations elsewhere enormously alter the intracranial pressure as measured by the venous pressure in the torcular and in the cerebrospinal fluid, as well as producing changes in the pressure of the arteries going to the brain. Furthermore, it has

also been shown that the CO_2 and oxygen content of the blood, adrenalin, and other drugs alter the intracranial dynamics by dilating and constricting the vessels of the brain. While the earlier physiologists denied completely the existence of a specific vaso-motor system dealing with the brain vessels, this position can no longer be held in view of many experiments which have been done.

It has been shown that the intracranial pressure, as measured by the pressure of the cerebrospinal fluid, is much more closely related to the venous pressure than to the arterial pressure; that changes in the venous pressure are immediately reflected in the cerebrospinal fluid pressure; and that the arterial pressure is more indirect in its importance.

PERSONAL EXPERIMENTS

We introduced the use of the internal jugular puncture method of Myerson and Halloran in order to study the intracranial dynamics in the living human being. A large number of experiments were done, in most cases with cerebrospinal fluid pressure methods, and in some cases with a technique by which the intracarotid pressure was measured. As a result of the experiments, we may state as follows:

1. That posture, that is the position of the head in relationship to the rest of the body, enormously changes intracranial pressure conditions, so that with the head down, the jugular venous pressure, the cerebrospinal fluid pressure, and the carotid-arterial pressure all rise rapidly and markedly.
2. That with the head up, the reverse is obtained, namely, that all these pressures drop.
3. Techniques which raise the arterial pressure also raise the intracranial pressure, if at the same time the venous pressure is raised, as with adrenalin.
4. Those techniques which do not raise arterial pressure but by which the venous pressure is raised, as under ether, raise the intracranial pressure.
5. There is a very marked difference in the effect on intracranial conditions between different types of anaesthesiae. Ether and amytal are fundamentally quite different in their effect upon intracranial conditions, the former raising intracranial pressure conditions, the latter changing them but little. Straining as at stool, violent expiratory efforts raise carotid arterial pressure, jugular venous pressure, and cerebrospinal fluid pressure. While these phenomena are amply compensated for in the normal person, it can easily be seen that where the compensatory mechanisms are damaged by arteriosclerosis, brain injury, and general bodily conditions, that the effect of constipation, chronic cough situations may easily be disastrous, and that the dizziness and headache, which are complained of under these conditions, are of purely physical origin.

We believe that it may be stated that the approach which we have made can be utilized with advantage in the study of the pathology of cranial conditions, such as brain tumor, abscesses, inflammation, and the like. It is easily demonstrable that the intracranial conditions are in constant fluctuation and are associated with marked change of pressure; that every move of the head and every effort, as well as respiration, intra-abdominal conditions, etc., enormously switch around intracranial pressures. These gross alterations are undoubtedly compensated for by a system of adjustment, consisting in the dampening of the pulsation of the arteries, the spatial relations of the veins and the sinuses, the rapid displacement of blood and intracranial content through the communicating veins between the intracranial cavity and the face, neck, and chest, as well as by rapid and efficient vasomotor alterations which speed up and slow down circulation in an efficient manner in the healthy.

"Encephalitic Sequelae and Their Treatment," by Doctor Samuel Smith Cottrell, reviewed the structural anatomy of the basal ganglia, and the pathological lesions found in the Substantia Nigra. The effects of Datura Stramonium were reported on the symptoms of the disease with charts showing changes in laboratory findings of twelve cases in which there was uniform improvement.

WINFRED OVERHOLSER, M.D., *Secretary.*

BETH ISRAEL HOSPITAL HOUSE OFFICERS' ALUMNI ASSOCIATION

The next meeting of the Beth Israel Hospital House Officers' Alumni Association will be held in the Beth Israel Hospital Auditorium on Tuesday, May 26, 1931, at 8:15 P. M.

Program:

Jewish Contributions to Medicine—Hyman Morrison, M.D.

RUTH WEISSMAN, M.D., *Secretary.*

BETH ISRAEL HOSPITAL PEDIATRIC CLUB

The next regular meeting of the Pediatric Club will be held in the auditorium of the Beth Israel Hospital on Thursday, May 28, 1931, at 8:15 P. M.

Program:

Differential diagnosis in some of the rarer surgical conditions of the abdomen in Children—Charles G. Mixter, M.D.

RUTH WEISSMAN, M.D., *Secretary.*

THE INTERSTATE POST GRADUATE MEDICAL ASSOCIATION OF NORTH AMERICA

This meeting will be held at Milwaukee, Wisconsin, October 19, 20, 21 and 22, 1931.

A TENTATIVE LIST OF SPEAKERS

Surgery

Dr. John F. Erdmann, Professor of Surgery, New York Post Graduate Medical School, New York, N. Y.

Dr. Burton J. Lee, Professor of Clinical Surgery, Cornell University Medical College, New York, N. Y.

Dr. John B. Deaver, Emeritus Professor of Surgery, University of Pennsylvania School of Medicine, Philadelphia, Pa.

Dr. Charles H. Frazier, John Rhea Barton Professor of Surgery, University of Pennsylvania School of Medicine, Philadelphia, Pa.

Dr. Dean D. Lewis, Professor of Surgery, Johns Hopkins University School of Medicine, Baltimore, Md.

Dr. John M. T. Finney, Professor of Clinical Surgery, Johns Hopkins University School of Medicine, Baltimore, Md.

Dr. Dallas B. Phemister, Professor of Surgery, University of Chicago Medical School, Chicago, Illinois.

Dr. Arthur Dean Bevan, Professor of Surgery and Head of Surgical Department, Rush Medical School, Chicago, Illinois.

Dr. Carl A. Hedblom, Professor of Surgery, University of Illinois College of Medicine, Chicago, Illinois.

Dr. Herman L. Kretschmer, Clinical Professor of Surgery, Rush Medical College, Chicago, Illinois.

Dr. Thomas G. Orr, Professor of Surgery, University of Kansas School of Medicine, Kansas City, Mo.

Dr. William T. Coughlin, Professor of Surgery, Head of the Department, St. Louis Medical School, St. Louis, Mo.

Dr. William D. Haggard, Professor of Clinical Surgery, Vanderbilt University School of Medicine, Nashville, Tenn.

Dr. Frank K. Boland, Professor of Surgery, Emroy University of Medicine, Atlanta, Ga.

Dr. Irvin Abell, Clinical Professor of Surgery, University of Louisville School of Medicine, Louisville, Ky.

Dr. Alton Ochsner, Professor of Surgery, Tulane University of Louisiana School of Medicine, New Orleans, La.

Dr. Clarence G. Toland, Los Angeles, California.

Dr. Frank H. Lahey, Boston, Massachusetts.

Dr. E. M. Eberts, Professor of Surgery, McGill University Faculty of Medicine, Montreal, Canada.

Dr. Frederick N. G. Starr, Professor of Clinical Surgery, University of Toronto Faculty of Medicine, Toronto, Canada.

Dr. Charles H. Mayo, Rochester, Minnesota.

Dr. William J. Mayo, Rochester, Minnesota.

Dr. S. W. Harrington, Associate Professor of Surgery, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. Waltman Walters, Associate Professor of Surgery, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. E. Starr Judd, Professor of Surgery, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. F. W. Rankin, Associate Professor of Surgery, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. George W. Crile, Cleveland, Ohio.

Dr. Robert S. Dinsmore, Surgeon, Cleveland Clinic Hospital, Cleveland, Ohio.

Dr. Charles C. Higgins, Surgeon, Cleveland Clinic Hospital, Cleveland, Ohio.

Orthopedics

Dr. Robert B. Osgood, Professor of Orthopedic Surgery, Harvard University Medical School, Boston, Mass.

Dr. Edwin W. Ryerson, Professor of Orthopedic Surgery, Northwestern University Medical School, Chicago, Illinois.

Dr. M. S. Henderson, Professor of Orthopedic Surgery, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. Arthur Steindler, Professor of Orthopedic Surgery, Iowa University School of Medicine, Iowa City, Iowa.

Medicine

Dr. Walter A. Bastedo, Assistant Clinical Professor of Medicine, Columbia University College of Physicians and Surgeons, New York, N. Y.

Dr. Russell La Fayette Cecil, Assistant Professor of Clinical Medicine, Cornell University Medical College, New York, N. Y.

Dr. Emanuel Libman, Professor of Clinical Medicine, Columbia University College of Physicians and Surgeons, New York, N. Y.

Dr. Harlow Brooks, Professor of Clinical Medicine, University and Bellevue Hospital Medical College, New York, N. Y.

Dr. Marion A. Blankenhorn, Associate Professor of Medicine, Western Reserve University School of Medicine, Cleveland, Ohio.

Dr. Russell L. Haden, Chief of the Medical Division, Cleveland Clinic Foundation, Cleveland, Ohio.

Dr. Louis Hamman, Associate Professor of Clinical Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland.

Dr. James H. Means, Jackson Professor of Clinical Medicine, Harvard University Medical School, Boston, Mass.

Dr. Elliott P. Joslin, Clinical Professor of Medicine, Harvard University School of Medicine, Boston, Mass.

Dr. Henry A. Christian, Professor of Medicine, Harvard University School of Medicine, Boston, Mass.

Dr. Franklin W. White, Boston, Massachusetts.

Dr. Cyrus C. Sturgis, Professor of Internal Medicine, University of Michigan Medical School, Ann Arbor, Michigan.

Dr. C. Sidney Burwell, Professor of Medicine, Vanderbilt University School of Medicine, Nashville, Tenn.

Dr. James S. McLester, Professor of Medicine, University of Alabama School of Medicine, Birmingham, Alabama.

Dr. John H. Musser, Professor of Medicine, Tulane University of Louisiana School of Medicine, New Orleans, La.

Dr. James E. Paullin, Jr., Professor of Clinical Medicine, Emory University School of Medicine, Atlanta, Ga.

Dr. Elsworth Smith, Clinical Professor of Medicine, Washington University School of Medicine, St. Louis, Missouri.

Dr. Warren T. Vaughan, Richmond, Virginia.

Dr. Charles A. Elliott, Professor of Medicine, Northwestern University School of Medicine, Chicago, Illinois.

Dr. Campbell P. Howard, Professor of Medicine, McGill University Faculty of Medicine, Montreal, Canada.

Dr. R. D. Rudolf, Professor of Therapeutics, University of Toronto Faculty of Medicine, Toronto, Canada.

Dr. J. S. Lundy, Assistant Professor of Regional Anesthesia, University of Minnesota Graduate School of Medicine, Rochester, Minnesota.

Dr. Leonard G. Rowntree, Professor of Medicine, University of Minnesota Graduate School of Medicine, Rochester, Minnesota.

Dr. S. F. Haines, Instructor in Medicine, University of Minnesota Graduate School of Medicine, Rochester, Minnesota.

Dr. William S. McCann, Professor of Medicine, University of Rochester School of Medicine, Rochester, New York.

Dr. Thomas M. Rivers, Rockefeller Institute for Medical Research (tentative), New York, N. Y.

Dr. Hilding Berglund, Professor of Medicine, University of Minnesota School of Medicine, Minneapolis, Minnesota.

Urology

Dr. Joseph F. McCarthy, Professor of Urology, New York Post Graduate Medical School, New York, N. Y.

Dr. William E. Lower, Associate Professor of Genito-Urinary Surgery, Western Reserve University School of Medicine, Cleveland, Ohio.

Neurology and Psychiatry

Dr. William A. White, Professor of Mental and Nervous Diseases (tentative), Georgetown University School of Medicine, Washington, D. C.

Dr. Louis J. Karnosh, Assistant Clinical Professor of Nervous Diseases, Western Reserve University School of Medicine, Cleveland, Ohio.

Oto-Rhino-Laryngology

Dr. Samuel J. Crowe, Clinical Professor of Laryngology and Otology, Johns Hopkins University School of Medicine, Baltimore, Md.

Dr. Fielding O. Lewis, Professor of Laryngology, Jefferson Medical College, Philadelphia, Pa.

Dr. G. B. New, Professor of Laryngology, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. William V. Mullin, Cleveland Clinic, Cleveland, Ohio.

Ophthalmology

Dr. John M. Wheeler, Professor of Ophthalmology, Columbia University School of Medicine, New York, N. Y.

Dermatology

Dr. P. A. O'Leary, Professor of Dermatology, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Radiology

Dr. B. R. Kirklin, Assistant Professor of Radiology, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. Willis S. Manges, Professor of Roentgenology, Jefferson Medical School, Philadelphia, Pa.

Dr. James M. Martin, Professor of Radiology, Baylor University School of Medicine, Dallas, Texas.

Dr. Bernard H. Nichols, Cleveland Clinic, Cleveland, Ohio.

Obstetrics and Gynecology

Dr. John O. Polak, Professor of Obstetrics and Gynecology, Long Island College Hospital, Brooklyn, New York.

Dr. Brooke M. Anspach, Professor of Gynecology (tentative), Jefferson Medical College, Philadelphia, Pa.

Dr. Otto H. Schwarz, Professor of Obstetrics and Gynecology, Washington University School of Medicine, St. Louis, Mo.

Dr. P. Brooke Bland, Professor of Obstetrics, Jefferson Medical College, Philadelphia, Pa.

Pediatrics

Dr. Alan G. Brown, Professor of Pediatrics, University of Toronto Faculty of Medicine, Toronto, Canada.

Dr. H. F. Helmholz, Professor of Pediatrics, University of Minnesota Graduate School of Medicine, Rochester, Minn.

Dr. William McKim Marriott, Dean and Professor of Pediatrics, Washington University Medical School, St. Louis, Missouri.

Dr. Isaac Abt, Professor of Pediatrics, Northwestern University School of Medicine, Chicago, Illinois.

Dr. William B. Peck, Freeport, Illinois, Managing Director.

President: Dr. Henry A. Christian, Boston, Massachusetts.

Secretary: Dr. Edwin Hines, Jr., Milwaukee, Wisconsin.

Chairman Program Committee: Dr. George W. Crile, Cleveland, Ohio.

HARVARD MEDICAL SOCIETY

Next meeting in the Peter Bent Brigham Hospital Amphitheatre (Van Dyke Street entrance), Tuesday evening, May 26, 1931, at 8:15 o'clock.

PROGRAM

Presentation of Cases.

"X-Ray Novelties," Dr. M. C. Sosman.

Dr. Cushing's 2000th Brain Tumor (Moving Pictures), Dr. Walter W. Boyd, Dr. Richard U. Light.

Medical students and physicians are cordially invited to attend. WM. P. MURPHY, *Secretary.*

SOCIETY MEETINGS CONGRESSES AND CONFERENCES

May 26—Harvard Medical Society. See page 1127.
May 26—Beth Israel Hospital House Officers' Alumni Association. See page 1125.
May 28—Beth Israel Hospital Pediatric Club. See page 1125.
June 3—Cardiac Course. See page 854, issue of October 23, 1930.
June 7, 8, and 9—The American Proctologic Society. See page 951, issue of April 30.
June 8—American Medical Golfing Association Tournament; Philadelphia. See page 1066, issue of May 14.
June 8-12—Woman's Auxiliary to the American Medical Association. See page 743, issue of April 2.
June 8-14—International Hospital Congress. See page 521, issue of March 5.
June 9—Medical Veterans Meeting. See page 895, issue of April 23.
June 9—The Scientific Session of the American Heart Association. See page 742, issue of April 2.
June 16-19—Catholic Hospital Association. See page 690, issue of March 26.
July 6-11—Medical Clinic, Paris. See page 520, issue of March 5.
July 26-31—Third Congress of the Pan American Medical Association. See page 632, issue of March 19.
July 27—The Post Graduate Course of Ear, Nose and Throat Surgery at the University of Bordeaux, France. See page 951, issue of April 30.
July 27-31—Third International Congress of Radiology, Paris. See page 789, issue of April 9.
Aug. 31 - Sept. 4—Neurologists will meet in Berne, Switzerland. See page 896, issue of April 23.
September 14-17—The American Public Health Association. See page 632, issue of March 19.
October 19-22—The Interstate Post Graduate Medical Association of North America. See page 1125.

DISTRICT MEDICAL SOCIETIES

Bristol North District Medical Society

September 17—Details to be announced.

Plymouth District Medical Society

July 17—Midsummer meeting. See page 1011, issue of May 7.

BOOK REVIEWS

A Manual of the Common Contagious Diseases. By PHILIP MOEN STIMSON. Lea & Febiger, Philadelphia. $3.75. 351 pages.

Dr. Stimson has prepared a splendid manual on the practical aspects of the common contagious diseases. He writes with a background of tremendous clinical experience gained at the Willard Parker Hospital for Contagious Diseases in New York City. Through his contacts the author is thrown in association with such authorities on contagious disease as Dr. William H. Park, Dr. Josephine B. Neal, Dr. C. Krumwiede, Dr. D. M. Tolle and others of the New York Department of Health.

Dr. Stimson begins with a clear résumé of the principles of contagion. Serum reactions, Diphtheria, Vincent's Angina, Scarlet Fever, Measles, Rubella, Pertussis, Parotitis, Varicella, Vaccination, Epidemic Meningitis, and Poliomyelitis are discussed in the successive chapters. The various diseases are considered from the point of view of their etiology, pathology, immunity, incubation period, clinical manifestations, general complications, general sequelae, differential diagnosis and prognosis, period of infectivity, quarantine, prophylaxis and general and specific treatment. The work is concluded with a chapter on the General Management of Contagious Diseases in the hospital, day schools, boarding schools, and at home. The Willard Parker aseptic technique is presented in detail.

The chapter on pertussis is the weakest link in the book. One would question the statement that "the best opinion today is that if a fresh vaccine is given in very large doses, the benefits derived are usually so definite in the prevention of the disease that exposed susceptible persons should be given the vaccine in practically every instance." Local opinion would also question the statement advocating x-ray treatments for reducing the severity and frequency of the paroxysms and of vomiting. No mention is made of the very serious intracranial complication of whooping cough, the so-called whooping cough encephalitis. The striking pathological picture of the whooping cough brain is not presented.

The post mumps meningo-encephalitis is of sufficient importance to warrant more than a brief mention.

It is disappointing that with the large number of scarlet fever cases available for study, the author or his co-workers at the Willard Parker Hospital have not given us an opinion on the Dick test and the Dick active immunization with graduated doses of toxin.

General practitioners, pediatricians, health officers, school and industrial physicians, medical students, interns and nurses will all find this authoritative little book of inestimable practical value.

The Pathology of Generalized Vaccinia in Rabbits. By RALPH D. LILLIE, Passed Assistant Surgeon, and CHARLES ARMSTRONG, Surgeon, U. S. Public Health Service. National Institute of Health Bulletin No. 156, August, 1930. Price 70 cents.

The bulletin presents a study of the gross and histopathologic effects produced by a heat-resistant vaccinia virus (Armstrong) in the production of generalized vaccinia in rabbits, together with a thorough review of the literature of variola and vaccinia. The experimental studies are concerned almost entirely with a description and discussion of the detailed histologic findings encountered in the focal and local lesions of the skin, mucosae, and viscera in experimental vaccinia.

The authors' descriptions of the lesions studied in the experimental work are detailed, clear, concise and exact. These are aided by the use of fifty-seven photomicrographic reproductions, and eight colored plates.

A generalized summary of the work indicates that the primary effect of the virus of vaccinia and variola is cell irritation and injury, with various forms of cell degeneration and coagulation necrosis. The visceral lesions are essentially coagulation necrosis. This condition is seen in the skin and mucosae also, in addition to proliferative, degenerative, hemorrhagic, and inflammatory changes. There is a greater inflammatory reaction in the covering epithelium than in the parenchymatous tissue, and it is primarily mononuclear and proliferative in character except in the occurrence of secondary invasion or necrosis.

Both pustular and hemorrhagic forms were encountered. Quoting from the author, "The cutaneous, mucous membrane, and visceral lesions of variola and vaccinia parallel each other so closely as to lead inevitably to the conclusion on purely pathologic grounds that they are the effect of one virus, which, it is true, shows varying degrees of virulence."